

AVIATION WEEK

JULY 14, 1952

50 CENTS

A MCGRAW-HILL PUBLICATION



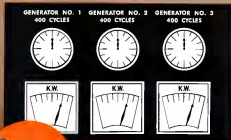
FRIENDLY ENEMIES

One of the Navy's GRUMMAN GUARDIANS makes a pass over one of the Navy's submarines. It's a case of "friendly enemies" . . . for as the mongoose is trained to kill cobras, these big, carrier-based aircraft are designed to find and destroy submarines. One type of GUARDIAN, equipped with long range radar devices, hunts down the enemy. Then others, lighter on radar but heavier on bombs, come in for the "kill."

GRUMMAN AIRCRAFT ENGINEERING CORPORATION, BETH

Contractors to the Armed Forces

Sundstrand's Constant Speed Drives can be operated in parallel and divide the load



Under steady-state conditions:

Load is divided equitably
within ± 2 KW
frequency maintained
at 400 ± 2 cps

Multiple drives precisely synchronized to maintain constant speed of the A-C generators

- **Using Synchronized Counter Speed Drives** any number of A-C programs can be operated in parallel or constant 100-cycle frequency (such as 2,000 under steady-state conditions). These speeds are synchronized, and the load is divided evenly without compatibility close limits—regardless of changes in electrical system loads or system status and distribution of the overall system. Maximum continuous power is provided, as is

Check with us now—let us put you
around a reliable master, a top engineer,
ing, and proven production to work
for you.



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**AIRCRAFT AND INDUSTRIAL HYDRAULIC TRAINING: PUMPS, MOTORS AND VALVES - 400 THREE PORTS - AIR SANDERS
INTRO - MILLING, GRINDING AND SPECIAL MACHINES - BRACKING RIGS - MARSHALL JOCKEY**

B.F. Goodrich



Again—Boeing lands newest ship on B. F. Goodrich wheels, brakes

LANDING GEAR on the B-57 Superbeast has to bring in safely one of the U.S. Air Force's largest transport beeing dets it with rght whch is a bicycle arrangement. The same B-57 Goodrich 60,000 lb. wheel proved on the B-47 is used. This wheel has more our loads on 300,000 lb.

The brakes are also B F Goodrich. This Expander Tube brake has a new kind of brake block. No rivets are used. The brake lining is cemented onto a light magnesium disc. The braking action applies equal pressure over the

full circle of the drum to give greater power, to distribute the load better. The narrow-cherry expander tube gives more baking, per unit weight, less fluid

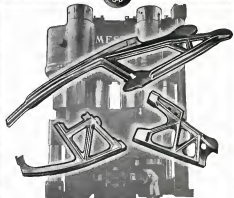
Landings are softer and smoother. BFG bankers respond smoothly and quickly to minimum pressure, take emergency overload better, cannot lock in gear. And they last longer because most of the brake lining is used. Elimination of stress prevents full positive brake and allows almost twice the useful life.

There are other advantages. Ventilated sheet piling systems have more readily

Rebar spring action diminishes with use. Rebar can be handled with a screwdriver and wrench.

Other aviation products come from BFG's research and engineering including tires, bonded rubber, De Ions, inflatable seals, Avionics, Pressure Sealing, Zippers, Plastack seals etc, fast cuffs, Rayovac, microsatites. The B F Goodrich Co. Aeronautical Division, Akron, Ohio.

B.F. Goodrich
FIRST IN RUBBER



Greater Size and Speed in Aircraft
Have created engineering problems, the solution of which has required larger and larger forgings of high-strength aluminum alloy. Examples shown above are forged structural members used in a modern military bomber, the largest made this service here ever. These are forged under 18,000-ton press, the biggest ever built in this country.

Wyman-Gordon Experience—the new
extensive in the industry in keeping abreast of new forging demands involving the use of Steel, Aluminum, Magnesium, High Density Alloys and Titanium.

Standard of the Industry for
More than Sixty-five Years

WYMAN-GORDON
FORGINGS OF ALUMINUM • MAGNESIUM • STEEL
WORCESTER, MASSACHUSETTS
HARVEY, ILLINOIS DETROIT, MICHIGAN

Domestic

Majority interest in Air Associates, Inc., Trenton, N. J. has been purchased by Eoscor Corp., Philadelphia. Eoscor Corp. president, C. Knecht Rector says no changes in management of the aircraft parts maker are contemplated at present.

Reg. Gen. Nelson S. Talbot, a TWA director and former Deputy Director of Procurement and Industrial Planning, AMC, died at his home in Dayton, O., July 6. He was 80. Talbot was a prominent Dayton industrialist and served in both world wars. He retired from active duty last June 10.

Legislation giving CAB authority to penalize ticket agents for "unfair or deceptive practices" in granting ticket rebates was cleared by Congress and sent to the White House for signature. CAB could impose fines of \$100 to \$1,000 each time an agent refused or granted a rebate.

Civil aircraft shipments during April totaled 191 planes valued at \$13.8 million and comprising 719,700 lb. During April, 49% engines valued at \$4.6 million and totaling 512,600 lbs. were shipped. Utilized orders for civilian planes of 3,636 lbs. and one aircraft weight mentioned in 1951 at the end of April.

Douglas Aircraft Co. plans to deliver 112 four-engine transports during the next 12 months, representing an estimated 3,699 passenger seats and 994 tons of cargo capacity. Douglas presently has firm orders for 175 such transports valued at \$216 million.

Harmon International Aviation Award for 1952 have been granted to Capt. Charles F. Blum, Jr., (master), for his successful F-11 flight over the North Pole from Norway to Alaska. Miss Jacqueline Arenal (investor), who set international speed record for women of 589 mph. on a 106-lb. closed course in a modified Vespene jet fighter 1A. Carl E. Seiberlich (navigator), for pioneering, developing and testing a pilot technique for use of lighter-than-air craft in towing underwater bombs. Trophy presentations will be made at the White House this fall.

James T. Hill, general counsel to the Secretary of the Air Force since July, 1950, has been named Assistant Secretary of USAF, replacing Eugene M.

NEWS DIGEST



REPUBLIC F-84 THUNDERBOLTS line up at Travis AFB, Calif., prior to an evening flight to Hawaii enroute to Tokyo in USAF test of ability to move fighter units rapidly to valuable key point in the globe. Plans now under study and

standbying teleports. This service is part of last Fighter Escort Wing which started out from Georgia. First test of the wing succeeded in completing the 1,400-mile trip from California to Hawaii in 5 hr. 29 min.

Zerkow who has been appointed to the Atomic Energy Commission.

May Patrick E. Kelly, deceased, and Henry Seiler have been cited to recover 1952 Thurman H. Bone award by Institute of the Aeronautical Sciences. Kelly was nominated for award "for developing techniques providing for structural stability and control of aircraft during high-performance phases of aircraft operation". Seiler's citation was "for developing and standardizing a navigation, capable of operating at varying altitudes, for use in combat or emergency aircraft". IAS has conferred Oestre Chancery Award for 1952 upon John C. Sall "for developing precise plotting techniques, enabling possible fundamental research in ballistics, dynamic stability and control, flutter, and structural loads determination".

Capt. Joseph Barles, 45, National Aeronautics test pilot, died at home in Miami Springs, Fla. He joined NAL in 1936.

War risk insurance plan for airlines and cargo on military planes is dated for submission to President Truman this week. If signed, as recommended by Commerce Secretary Brown, the measure will go into effect immediately.

Northrop Aircraft, Inc., has purchased Kidnaplane Co., Van Nuys, Calif., maker of dove target planes, having military contracts totaling \$15.8 million. Kidnaplane president, Walter C. Collins, will head the new Northrop division.

Boeing and Western Airlines flew 428,131 revenue miles and 1,196 flight hours on military and commercial flights over the Pacific and Atlantic during May.

Financial

Danaher Helicopter, Inc., Danbury, Conn., has completed sale of capital stock, netting the firm \$116,900. The stock from such financing total \$215,000, obtained by sale of 77,000 shares since Apr. 1. Danaher also has obtained a \$15,000 advance to finance an aerial U.S. Army order for YH-31 rotorcraft subcontracts.

G. M. Giamini & Co., Inc., Pasadena, Calif., has received dividend payments on its 4% cumulative convertible preferred shares. The dividend was declared June 1 in addition of second June 27 in payment of arrears prior to Jan. 1.

International

BOAC-DEI Comet left London Airport July 8 on 25,000 mi. proving flight to Tokyo in preparation for opening London-Tokyo Comet service "early in 1953".

Mayne Bustin, pioneer French aviator, was killed July 6 when Nord 262 he was piloting during air show near Lyons crashed. Bustin other occupants of the plane also died.

Helicopter and motor is planned for Cuba as part of a new program to carry oil fuel and second-class mail by air. Mail would be carried by fixed wing aircraft from Havana to the capitals of the provinces, where the copter would pick it up for delivery to villages. The Cuban post office estimates 15 to 20 helicopters will be needed.

AVIATION CALENDAR

- July 14—Regional air safety forum sponsored by Corporation Aircraft Owners Assn. (R. Leon, dir.) and CAA, topic to be "Weather Flying", Kees Airport, St. Louis.
- July 16-18—Sessions of the Aeronautical Sciences annual summer meeting, 145 Wilshire Boulevard Building, Los Angeles.
- July 18-20—Women Physicists of America national convention, Chautauque, Tulsa.
- July 23-26—Silver anniversary celebration, Palo Alto College of Aeronautical Technology, Palo Alto, East St. Louis Ill.
- July 26-27—New England Flying Meet, Lawrence Airport, North Andover, Mass. (Open days following weekend.)
- July 26-31—University Aviation Assn. 19th annual meeting, Ball State Teachers Coll. Sigsbee, Muncie, Ind.
- Aug. 1-10—Society of Automotive Engineers annual West Coast meeting, Fairmont Hotel, San Francisco.
- Aug. 27-30—National Flying Pattern convention, Albion Polytechnic Institute, Auburn, Ala.
- Aug. 18 Sept. 1—International Aviation Exposition, sponsored by Aero Club of Monaco, including Cosmairtel Motor Vehicle Race, Wiesbaden Airport, Germany.
- Sept. 3-7—Society of British Aircraft Constructors annual display, Farnborough, England.
- Sept. 4—Continental of Engineering Transport, Hotel Knickerbocker, Chicago.
- Sept. 6-12—Instrument Society of America annual national conference on instruments and exhibit, Cleveland.
- Sept. 16-17—Aeronautical Fair, Fiumicino Airport, Milan, Italy.
- Sept. 17-18—International Air Transport Assn., eighth annual general meeting, Geneva, Switzerland.
- Sept. 25-Oct. 1—National Electronics Conference, Sheraton Hotel, Chicago.
- Oct. 1-4—Society of Automotive Engineers annual scientific meeting, aircraft engineering, display and aircraft production show, Hotel Statler, Los Angeles.
- Oct. 9-10—Aerospace management symposium convention, Oklahoma University, Norman, Okla.
- Oct. 21-Nov. 2—International aviation and travel exposition, New York, Chicago.
- Nov. 4-7—National Radio and Telephony Institute, Society of Automotive Engineers, The Mayo, Tulsa, Okla.
- Dec. 2—Symposium on light metal alloys, function and relations to conductors and craft, Society of Automotive Engineers, Hotel Statler, N. Y.
- Dec. 44—Seventh annual Aviation convention, jointly sponsored by Bishop and Douglas Chamber of Commerce, Douglas, Ariz.

PICTURE CREDITS

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APPROVED — only the front line express



CHASE AIRCRAFT CO., Inc.
WEST TRENTON, NEW JERSEY



"SUPERPROBITY" SUE HUNTER—Pre-production prototype Fanny Gosssett subsonic plane, comes with one of its American Salsbury Double Mustangs topwing units that folds out and prop. (top) This late model has auxiliary tail fin, seats three.

Foreign Aviation Developments on Trial



SWEEPING FIGHTER TESTED—Hawker P. 1012 (above) proven to engage swirling when closed RMS Eagle during trials to decrease maneuvering characteristics of sweeping planes. P. 1012 was fitted with special landing gear for tests.

FRENCH TEST FLEET—Dassault (below) fitted with a two of French Escopette 1040 prototype units under each wing is used to give flight data. Each weighs 11 lb., pushes 22 lb. thrust. Length of the prop is 8.17 ft., diameter is 7.33 in.





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The Bell HTL-4 and H-13D Helicopters are particularly used in being battle wounded out, and do it fast... carrying them in these comfortable, warm, safe litters.

In Korea, the U.N. High Command says, the HTL-4 and H-13D saved 7500 lives in less than ten months!

We make the precise rotor transmissions for the HTL-4 and H-13D that assure a positive, smooth, gentle lift as the helicopter floats the wounded off

the ground and saars swiftly to a base hospital. Precision... in design and production. That is what we have been doing for 37 years. Now 90% of our defense work is on aircraft and ordnance contracts... for one part or a million... and all to the highest precision standards!

All this gives us inward satisfaction... satisfaction because through our products, we are aiding our fellow men, and helping to build our nation's defenses.

THE STEEL PRODUCTS ENGINEERING CO.

engineers and manufacturers
Springfield, Ohio

WHO'S WHERE

In the Front Office

Lawrence L. Rothman has been named a vice president of **Republic Aviation Corp.**, Farmingdale, N. Y. Rothman joined the company 12 years ago, most recently, has been sales manager. He will continue direct sales of sales activities.

Robert H. Charles, vice president of **McDonnell Aircraft Corp.**, St. Louis, has been placed in charge of the firm's newly formed contracts division. In this department, **D. F. Moore** has been named manager of contract contracts administration. **John Alldridge** has been put in charge of a new staff and senior division.

Joseph H. Regier has been designated vice president of **McDonnell Aircraft Corp.**, St. Louis, and will make his headquarters in the company's executive office in St. Louis. He previously was vice president general manager of the firm's **McDonnell Aircraft Corp.**, Philadelphia.

William J. Gray has been made president and a member of the board of **General Laboratory Associates Inc.**, Mineola, N. Y., makers of aviation division for jet engines. Gray, formerly a vice president of **SC Corp.**, recently left the firm.

Richard H. King has been promoted to vice president (title) for **TWA Aircraft Division**. King formerly was general traffic manager for the airline, which he joined in 1949.

Ray Watkins, formerly made manager and vice president manufacturing for **Boeing**, Chicago, under of engine and electrical products, has been made executive vice president of the firm. He will also be in charge of production at **Boeing's** Chicago, Ill., plant. He joined the company in 1941.

John E. Wadley has been appointed an assistant to the president of **Wadley Sales Co.**, Hollywood, Calif. He came from **Pacific Aviation Corp.**, where he was an assistant to the president.

Changes

Clive Bishop has been appointed to the new post of general manager and material control supervisor for **Pacific Aerospace Corp.**, San Diego, Calif. Bishop formerly was in charge of the firm's material control supervisor for **PAC**.

A. C. Lofgren has joined as manager of **Lockheed Aircraft Corp.**'s aircraft production department. Lofgren, formerly a former general manager of **Anderson Aircraft Co.**, St. Louis.

Paul E. Graham has been designated as vice president of **Collins Radio Co.**, Cedar Rapids, Ia., replacing **Albert K. Hagg** who has retired his activities for health reasons. Hagg will act as a vice president in Collins.

Frank B. Lewis has been appointed sales manager of **Aviation Parts Division**, Kewanee, Ill., for **Boeing**.

Charles Regier has been named assistant director of machine relations for **McDonnell Aircraft Corp.**, St. Louis, Mo., succeeding **P. A. Brown**, resigned.

INDUSTRY OBSERVER

Industrious that **Douglas Aircraft** is interested in the proposed \$300,000, 100,000-lb. payload long-range military transport plane, says the report. The report, which is the result of a study by **Donald Douglas**, N. Y., who discussed capabilities of such a plane. It would have approximately 400 mph, operating speed and would be capable of delivering its load with minimum number of stops enroute in the world. Interest in this type is believed to be growing out of test cargo runs being made by **USAF** with the **C-119** and **C-124** and engine experimental transport (*Aviation Week* June 2, p. 14). **General** also is much interested in development of a production transport in this category.

Establishment of a permanent U.S.-British-Canadian technical conference on conditions of engineering standards is expected eventually to pay big dividends in international aviation projects and in many other fields. Agreements on drafting standards also are expected to save thousands of man-hours in future projects, such as cross-licensing of aircraft and aircraft engine designs. **Howard County**, IDA, director of research, is present chairman of the conference, which next meets Oct. 14.

Mythic IV is the designation of the new supersonic model of the **F4U Corsair** jet fighter. Plans to design it for flight in about two months. It is slightly larger than the earlier **Mythic** plane, though engine similar in configuration. **Pratt & Whitney** is expected to build a **Hagana** Sixty version of the **Rolls-Royce** jet engine, or the **F4U Corsair** built by **Boeing**.

Fisher Body Division, **General Motors Corp.**, is starting production in Detroit on low and high speed assemblies for the **F4U Corsair**. **Pratt & Whitney** fighter to be assembled at **Kearney City** by **Boeing** **General Motors** assembly division of **General Motors**.

Douglas YC-124B transport, powered with **Pratt & Whitney T34** turbojets and **Curtis** propellers, is making ground ratings of its engines. At last reports it had about 10 to 11 hr. ground time on the propeller.

First production propellers for the **Douglas A2D** turboprop were shipped before are due to be completed at **Aerospace** division, **General Motors Corp.**, in late summer.

Some orders are expected looking with interest at the **Lockheed XC-130** turboprop high-wing cargo plane, now in mockup stage, with a view toward development of a passenger version of the plane.

The second of **General's** **NP-1A** Navy long-range turboprop planes is expected making completion in San Diego, probably by this fall.

Chrysler designs, **General Motors**, is receiving delivery for a new engine of 172 mm. (6.8 in.) diameter by the **Pratt & Whitney** firm of **General Motors**, **Rolls-Royce** and **Pratt & Whitney** in **Yonkers**, N. Y., plant where it is making **Wright R3370** engine. The machine tool order over \$1 million, **General Motors** Agency has declined.

As **Boeing** has told Congress the number of initial construction engines on the **B-47** bomber ordered under fiscal year 1951 and 1952 appropriations. "That is, the six on the original contract," is \$220. This indicates that the number of **B-47** bombers ordered under these appropriations is 579. As a result of the new **As** **Boeing** policy of reducing the number of jet engines by reducing production time to less than one year, **Boeing** engine requirement for the **B-47** has been cut from 25,548 to 5,966.

Avco **General's** **CF-100** fighter will not be produced in large quantities this year because of important changes in aircraft requirements—expected to be made of lessons learned in Korea, which have shown that close development has for outgrowth of a new aircraft. **Avco** **General** officials say that, having withdrawn from the **CF-100**, **Boeing** will get out as two squadrons this year, with the job well in hand by 1955.

Air Power in Politics

Scouring off to national political party conventions, Congress left behind a session with three air power highlights:

- Sen. Robert Taft projected air power into politics with claims that he is for it—although he voted against funds to implement a 50-group Air Force in 1950.
- Gov. Dwight Eisenhower took credit for being a key factor in winning the fight for USAF's independence.
- And, Democratic presidential opponent, Sen. Richard Russell, denied the criticism for air power with verbal attacks as the Administration for stretching out the date for achievement of a 543-wing USAF from Joint Chiefs of Staff's target of mid-1954 to mid-1955. He most likely was the Administration's rebuff on the 70-group program laid in 1949, however.

Yes, despite all of the debating in favor of air power, congressmen were inclined to put economy first. But they did drop that of going on record against air power.

It was on the list of political life that two congressional Republicans in air power experienced as a successful fight for the \$11.6 billion needed for plans to construct for this year to achieve a 543-wing USAF in two years. They were: Sen. Lyndon Johnson, chairman of the Senate Preparedness Committee, and Sen. Joseph O'Mahoney, chairman of the Senate Armed Services Appropriations Subcommittee.

This is the history of the \$11.6 billion:

- House Appropriations Committee, in recent session, shaved \$150 million.
- An attempt by Minority Leader Rep. John Kennedy to increase the procurement limit to \$13.5 billion was shelved down on the floor. It didn't even have enough support for a recorded roll-call vote.
- Senate Appropriations Committee, in recent session, trimmed an additional \$43 million.
- Sen. Johnson and O'Mahoney presented sufficient support for a roll-call Senate vote to restore the \$10.9 billion living authority of the Senate protest voted for this including 19 of the 28 members of the Senate Appropriations Committee, which previously voted as solid as possible against to curtail the House in cutting plans, however.
- House went along with the \$12.6 billion, with near zero votes against in members who had straggled to join the fray.

But the only way to challenge the \$12.6 billion total voted by the Senate was a recorded roll-call vote of the House in favor of reducing to the \$10 billion cut it originally approved. It wasn't required. OMAH was that as a record vote, the House, like the Senate, would vote for the \$12.6 billion.

At this time, members didn't want to be recorded "against" air power.

Next year isn't an election year, however. Congress may not be too vocal on air power and still be continuing.

Air Force: Loss of Favor

An Force's term of high favor with Congress ended. These were these two factors:

- Administration's reduction of Air Power—Although the Administration cut USAF's budget from the \$26.7 billion to \$20.7 billion, congressmen felt that with the 543-wing program the Administration is, at long last,

doing exactly by air power. These was talk of increasing funds to the level wanted by USAF, but it isn't.

- Misleading Description with USAF Inefficiency—More than the other two agencies, Congress is increasingly critical of USAF on this score. Examples:

- Complaint of Sen. Wayne Morse, who has consistently voted to increase air power, was inadequate: "The most wasteful of all branches of the service."
- Senate Preparedness Committee, perceiving USAF to reduce its mixed costs, pointed out: Only 4% of the 1,685 men at a jet fighter wing are pilots to fly the 75 planes.
- Congressman criticized USAF budgeting as "incomplete, haphazard" and "disastrous" in its use of money. For example, the cost figure was 2.5, but when USAF couldn't fit all the construction it wanted using the Budget Bureau's ceiling of \$1.5 billion, it simply reclassified its cost figure to 1.5 on the books—even though 1.5 was the actual cost factor.

Now: A Gain in Favor

New national declared by earlier criticism as an alternative to land-based aviation involving a big money outlay for a worldwide system of bases.

But in Congress, thinking air power still tends to be questioned with the Air Force.

Considered by cuts at other categories, though, Congress' cut in Naval aircraft procurement caused no controversy. \$50 million off a total of \$356 million in 1954.

CAA: A Sharp Cutback

Civil Aeronautics Administration was a key target of congressional antagonism. And congressmen expressed it by cutting CAA's appropriations. It will mean a sharp cut in its role in CAA activities.

- House reduced CAA's request for a \$167-million budget for this year to \$146 million.
- Senate shaved it further to \$142 million.
- Then, confusion occurred on the lowest figures in the two versions and CAA came out with a \$143-million budget. This compares with CAA's \$167 million budget for last fiscal year, which ended July 1, and its \$177 million budget for the year before.

NACA: Cutback, Too

Despite much verbal tribute to the importance of research and development, National Advisory Committee for Aeronautics, also will have to reduce its level of operation slightly to keep within the budget approved by Congress.

- The agency has \$48.5 million for operations, compared with \$50.6 million for last year and the \$57.8 million NACA wanted for a stepped-up program to go hand in hand with the buildup of air power.
- And only \$12.7 million of the \$26.7 billion NACA requested for new construction this year was approved.

CAB: Slight Cut

Civil Aeronautics Board find neither will with the congressional Congress. The \$3.8 million budget voted the Board for this year is only \$50,000 less than last year's budget.

—Katherine Johnson

Titanium Demand Outpaces Production

Aircraft industry plans many uses for metal.

So even expanded output will fall short of needs.

By Alexander McElwain

Without failure to build its real significance, no apparent major aviation cost in primary aircraft materials is being held back the arms of the U. S. aircraft industry.

It comes on the lightweight new "middleweight" aircraft, not only, titanium, which now appears set for a much longer role in aircraft structures as well as components within the next few years.

• **Equal Production—Timing depends largely on the speed with which the primary raw production capacity of titanium can be expanded to meet early large requirements.**

Typical as have major Defense Department now finds the expansion of titanium capacity in fact the last step the department has recently set up its first four requirements for the material for military use.

This call for new times the available supply in 1951. And with expansion promising at the planned rate, the requirements are going up at a rate which will keep 1953 requirements all over twice the present supply.

• **Aviation as Fastest—How much of the available titanium will go for aircraft is still cloudy. Army wants titanium for tanks and armor plate and ammunition.**

Now says it is, for surface craft use. But the inevitable problems of treatment and alloying that are being made with it already are leading many applications in aircraft and engine parts from the military.

Commercially, Production and Resources Division, at An Methyl Chemicals Company, Wright Patterson AFB, Ohio, is spearheading a campaign to broaden its use in aviation.

• **Costs—Ken D. Metzger, chief of the division, wants titanium to enjoy wide strength in but as its production will permit. But he doesn't want it to move faster, and give him a new name for his backbone.**

• **Unsure Position—It doesn't seem to be the sweetestest corner position of wanting the aircraft industry, pick up the titanium left and run with it in various**

Titanium Characteristics

What is titanium, the new metal so important in aircraft production?

• It is a silvery gray metal, weighing 0.16 lb./cu. in., 60% heavier than aluminum but only 16% as heavy as alloy steel.

• It is the only structural metal known to have an endurance limit consistently as much as 50% of its tensile strength.

• It is a metal so described in fact as prior to all the small engineering metals and alloys in strength weight ratio.

• It is a highly corrosion resistant, having a corrosion-fatigue behavior in salt water practically identical to that in air.

• Its impact strength is superior to aluminum and higher than most alloy steels, some tests indicate.

• It has an extremely high melting point for such a light metal (3,150°), but it is not as strong and becomes brittle under continued exposure to temperatures

above 1,800° F. Metallurgists doubt if this reaction to continued temperatures above 1,000 deg. can be greatly moderated by future developments.

• Some titanium has a tendency to creep (slowly but under static load) but cold working and alloying greatly improve the characteristics.

• Modulus of elasticity is superior to aluminum, but well below alloy steel.

• Fabrication by conventional power tools, die casting or deep press still presents problems, but there are being working with improved quality and workloads of metal.

• Current applications involving sliding contact are questionable until suitable coatings are perfected.

• Tensile strength of high strength titanium alloys is not yet satisfactory, and it is still impossible to weld titanium structures to other metals.

Source: Titanium Corp. of America.

ductance, requirements were, without costly extra steps to back up the requirements.

Here are some things that not being done with titanium as the result of duty, many of which have not been required previously.

• **Lockheed Aircraft Corp.** is taking advantage of the significant high-strength-density ratio of titanium to lighten the fuselage of many versions of its Constellation, with an appreciable weight saving.

• **Boeing Airplane Co.** is using titanium to make a number of large titanium components, to save weight in the 30-51 jet fighters.

• **Northrop Aircraft Inc.** has conducted a study of the use of Ti-74 titanium metal, cold drawn (at room temperature) and superalloy jet tested in a 57% pressure, where there were 24-57 titanium alloy tests and 50% greater ultimate tensile strength. However, the titanium alloy tests required approximately five times longer driving and 45% greater pressing pressure.

• **Consolidated Vultee Aircraft Corp.** reportedly is using considerable quantities of titanium alloy because of its

superior heat strength and weight saving capacity in the new armed-carrying N-101 intercepter.

• For the same reason of heat resistance, titanium alloy sheet is being considered as a skin material for several of the guided missiles now under development, and in at least one it is hoped to have virtually a complete exterior of titanium alloy sheet to better withstand the high temperatures generated by its fuselage.

• **McDonnell Aircraft** has a Navy contract to produce something big looks out of titanium: the Navy's new 100-100 (Aviation Week July 7, p. 8).

• **Boeing Aircraft Co.** plans to make about 15% of the nacelle drive in the new DC-7 of titanium, using 200 lb. (Aviation Week June 16, p. 9).

• **General Electric—Windsor, the** use of titanium in air motors and engines of the future is also growing in acceptance (Aviation Week June 16, p. 46), with Westinghouse reporting same, as in vegetation of the metal, is compressive data, compressive stress, compressive loads, joints, compressive and tensile loads, and sheet metal parts.

Aluminum is reportedly experimenting

turned back in April, 1951, was operational at last report with a lag of about 150 hr in Korea. Availability was increased 90% up until April of this year when it dropped to 80%.

► **Take punishment**—Along with the ductility and availability, the helicopters have taken considerable more punishment than once was thought possible. Tips of rotor blades have been knocked off. One hit 18 inches, and although the pilot felt a heavy shock force, he flew back to base. Another suffered heavy damage to the rotor span, but the pilot kept it airborne in spite of the strain on his nerves.

Despite its fine performance in Korea, the HRS-1 is just the start in the development of combat transport helicopters. The Marines want an assault helicopter capable of hauling 25 to 30 combat-equipped troops, or 5,000 to 6,700 lb. Contrary to its classification as a troop-transport helicopter, the HRS-1 actually carries five combat-equipped soldiers plus pilot and copilot, or 800 lb. of crew.

Maximum power-31 tonnes (about 100 hp) from here that what is needed is a helicopter designed from the ground up, including engine tail driving mechanism. One of the reasons for the lower than specified performance of the IH351 is power. Those used in Korea are equipped with Pratt & Whitney XA50-37 engines, designed for the SHT (AH-64) tandem. Although the engine is rated at 680 hp, the Maxims claim it actually turns over only 500 hp. With the 500 hp engine the IH351 is supposed to have, it is a probable performance would never closely approach design would be

Which are manufacturers looking for for combat operations? Pilots prefer self-aligning seats for operations in mountains and from rough dirt fields. Other improvements are required in the shifting design. The pylons were working but reportedly are all right now following recent modification.

Roughness must be built in to future combat helicopters.

Titanium to Be Used In Navy Fighter

Titanium is going to figure importantly in the making of North American Aviation's FJ-3 Navy fighter being produced at the company's Calverton, O., plant. For this carrier-based plane, the metal's corrosion resistance, as well as its other physical characteristics, is important.

Report is fast becoming will be the material for such parts as channel sections, webs, angles and engine clamps on the F1-1.

Separation Out

- Congress fails to act on mail pay, subsidies.
- It means new fight over issue in next session.

Congress left Washington last week without enacting normal salary increases for federal employees and there was scant prospect that it would be reactivated before next January.

Blistering Attack—A majority of the committee voted a bill following the recommendations of Air Transport Asia. Promptly a six-man minority issued a blistering attack on the bill. They were Republican Reps. John Heston and Charles Walmater, and Democratic Reps. Arthur Klen, William Goodland, Louis Heller and Morris Mandel.

The recently agreed legislation opposing the majority bill on every conceivable point. They followed the recommendations of the Address Committee—Bureau of the Budget, Post Office Department, Civil Aeronautics Board—on all but one major matter. The merchants would make some 12 million credit ratings who do not carry mail eligible for schools as the Commerce and National Defense interest. Advertisements would be subject to mail

► **Report Unsigned**—The majority report was not signed. It was filed by Rep. Peter Frost.

The majority threatened to bring the fight out into the open on the floor of the House and obtain a second vote on substitution of the legislation they backed.

Rules Committee refused to close the majority margin for House action, reportedly at the request of the White House. However, most of its provisions had been approved by the Senate and required only House concurrence to become law.

With overwhelming support in Congress for the principle of separation of subsidy from normal pay, this means another knock-down drag-out fight next year over specific provisions.

• **Battle Postponed**—But it postpones an uphill battle for the airlines to obtain appropriations for subsidy from Congress.

Here are highlights of the minority report:

• **Provisions** of the capacity bill requiring that the normal rate for international carriers be "at least" the Universal Postal Union rate, now per cent.

at \$2.86 a ton-mile, would mean a "hidden subsidy" of over \$20 million a year, detracting from the purpose of separation legislation. It would compare with actual charges for carriage of first-class passengers of approximately 70 cents a ton-mile and 33 cents a ton-mile for freight. Post Office Department would have to pay almost \$30 million more a year as "compensatory" and pay under the Universal Postal Union rate than it would under a cost-of-service-plus-overhead formula.

• **Yuck!** of "fair and reasonable" set by the majority bill for determining compensatory road rates for damage the criterion is not adequate. It would open the door for "value of service" to be considered as a factor in determining a rate, and "a rate based on 'value of service' merely means that it is based on 'what the traffic will bear' . . . This inevitable result of failure to provide a cost standard means what the Post Office and the taxpayer can bear."

• CAR should not be given authority to enter contracts with the airlines for subsidy payment as provided in the report; but "Future Congress should be left unfettered in their decisions to raise or lower airline subsidies."

- **Postmaster General** should not be prohibited from channeling mail from a regional carrier, charging a higher mail rate, to a trunk line with a lower rate.
- **Minimum of 15 lb.** on each shipment set by the majority bill "would result in substantial payments for fictitious loads in excess of the actual load carried."

Senate Kills Bill on Economic Violations

Legislation giving Civil Accounting Board authority to impose civil penalties for accountant violations, up to \$1,000 for each offense, was killed in the Senate by Sen. John Sparkman.

Sparkman's comment: "My reasons are based solely upon a lack of confidence in the Civil Accounting Board to deal with small public accountants."

If given the power contained in the bill, CMB could prosecute those companies for violations of infants' regulations and could take action against doctors, whereas in the past they have been threatened in that direction by the courts. The Board could sign a

with a penalty here and a penalty there, a hundred-dollar fine here and a three-and-dollar there, and then punish the wall lines."

Spokane erupted CAB member Joseph Adams, who "has vigorously opposed . . . the desires of his colleagues to eliminate the small sidings and stub connections."

STANDARD EQUIPMENT



• Some Hydro-Aire Actuators have the reputation for accurate duty of helping to keep birds out of the jet engine air ducts. On the other hand, Hydro-Aire's flight control actuators are engineered to give "co-pilot" assistance to the pilot flying at supersonic speeds.

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Abstract

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Poor Flying Privilege, Says FAI

Personal flying all over the world showed a slight decline during 1956 compared with the previous year, and on an international scale there is no apparent sign that there will be any improvement soon, the Fédération Aéronautique Internationale reported at its recent meeting.

FAI's 45th conference was held in Madrid and attended by representatives from 25 countries. The Tearing Committee discussed the need for an international private letter certificate to permit travel and permit pilots to operate all types of personal planes while visiting various countries.

FAI also asked for the halving of the amount of insurance coverage required of the private owner, as proposed by the International Civil Aviation Organization, relating to damage caused by foreign aircraft to third parties on the ground.

A decision was made to award an FAI diploma each year to persons who have made a noteworthy contribution to private flying. Nominations are solicited from the member clubs, with acceptance of the diploma to be chosen by an FAI committee.

French AF to Get Third of Arms Find

By Ross Hamilton
(McGraw-Hill World News)

Paris-French Defense Minister Rene Pleven told the National Assembly France is building toward an air force of 17 squadrons (1956 combat planes) by the end of this year and hopes to acquire French air strength to 41 squadrons by the end of 1957.

The end France is spending 30% of the total allocations to French armed forces on the air arm this year, compared with the air force share of only 21% in 1955.

"If we reach this an approximation," Pleven said in explanation of the increased spending for air power. "It is in the air that the discrepancy between our forces and those of the western enemy will be the greatest."

► **39 New Azules**—He had no apparent part of his fleet finds this year will not be used to construct air fields and other air installations for the French and NATO air forces. By the end of this year, France and 20 new air fields will have been completed in France, allowing the deployment of 3,000 additional aircraft. Under existing plans, stretching from the channel to the Swiss border, also will be an expansion and thousands of new ground

communications for military use will have been laid.

France and aviation is being pushed in the French aircraft building industry but that the industry still is acquiring considerably below capacity because of lack of funds. He said he hoped to be able to improve matters in 1957 by the placing of a large United States "offshore procurement" order with the French aviation industry that would enable the industry to boost its production.

British Exports Hit \$118 Million

Cost Britain, which has been making heavy and successful efforts to build up its aircraft export business, set a preliminary \$118 million worth of planes and parts abroad last year, the latest part being advised.

The British feel that civilian aircraft export sales can increase in proportion over the next few years with an abundance of their airports and jet transport. But shortage of skilled labor still places them, though aircraft exports, in a strong position. Between mid 1955 and last March, the total completed in making aircraft and parts was 17,800, a 25% increase. There also is a critical shortage of jet engine compressor blades in the moment.

Aircraft exports are being strenuously pushed because of the high rate of return compared with other products. A jet transport for example, sells for about \$25 per pound of aircraft compared with less than \$140 per pound for a car.

Car Ferry Planned For Key West-Cuba

(McGraw-Hill World News)

London—Silver City Airways, which operates a ferry vehicle and passenger air ferry service, the Channel from England to France (Aviation Week June 2, p. 58), is attempting to transplant a similar service to the Western Hemisphere.

The carrier hopes to work out an arrangement with an American carrier to set up a deal between Key West, Fla., and Havana, Cuba. Silver City has been working that area for two years. It had intended to operate the service itself on a profit basis, but U. S. authorities rejected the plan.

Silver City has made large gains in just a few years with its aerial idea, and the company is endeavoring to be placed under the flag by Blackburn & Universal GAC-66 (Universal Freighters, the first firm order Black has received for the transport).

Trim Tab Control System Airborne Actuated



This latest model of trim tab system is a typical application of an R-118 ROTORAC Electric Rotary Actuator with right angle idler. It includes a very ANGLE level per unit with variable connecting links to the servo link.

The R-118 ROTORAC—developed by engineering, they control system—is basically a reversible geared motor, ingeniously braked, with right angle power idler and provision for mounting the number of shaft revolutions between desired limits. Its compact design permits location in tight spots.

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Redesigned Proteus Has Better Engine

- Test runs of model III of Bristol's turboprop engine show better thrust and fuel consumption than estimate.
- And this improved performance is obtained despite reductions in the powerplant's weight and length.

By David A. Anderson

The Bristol Proteus III (705 series) turboprop engine is a most economical powerplant, so says the latest test data done on the unit, which was recently run for the first time at the Filton, England, works of the Bristol Aeroplane Co., Ltd.

That test was shown that the Proteus III best its performance estimates by substantial margins. It developed 24½ (possibly 25½, depending on the figure used) more thrust at 6½ less specific fuel consumption than the estimated ratings. And these results were obtained with a low turbine entrance temperature, an important factor in obtaining the long life expected of a transport engine.

Four Proteus engines of an engine-variant power the prototype Bristol Revenant, one of the engines, are coupled in pairs and the other two singly will fly the Saunders-Roe Puma in late this summer. The 27 production version of the Britannia also can order for Bristol Overseas Airways Corp. will be powered by the Proteus III.

Design and Progress—The first Proteus engine ran in 1947 and the subsequent years have seen it at two variants, in spite of the fastest progress for the Proteus II mentioned above, there are no plans for production of the engine. That claim that it will not sell with the Proteus group came a few months ago when the Bristol aviation press board—some too reliably—that the Revenant was underpowered. (The plane weighs about the same as the Boeing Stearman—around 195, 660 lb—and has about 1,200 hp take power available for itself, so perhaps these comments were well-founded.)

Bristol decided to redesign the engine to reduce the weight-power ratio and the fuel consumption. Mechanical and aerodynamic changes were planned to attack these objectives, and the results were two-fold. First, Bristol expected the performance of the engine, second, they reduced the weight and length of the unit.

Right now the test data shows that the Proteus III develops 4,180 hp for itself, with an additional 400 hp thrust of 922 lb. For this condition, the specific fuel consumption is 0.59 lb. per hp. per hr. based on brake-horsepower, if equivalent horsepower is used as the base, the specific fuel consumption is down to 0.57 lb. per hp. per hr.

Engine Description—Proteus III is a reaction-flow engine which retains the radial-flow compressors of the earlier series, there are twelve stages of axial compression followed by a single stage of centrifugal compression. Eight heavy cast-iron casings the steel compressor main. These are two separate five-bladed, each of two stages, one drives the compressor, the other the propeller.

Overall length of the new engine is 100½ in. which is about 11 in. shorter than the Proteus II, engine diameter is now each greater at 38½ in. Dry weight, excluding screens gas has drive, is 2,650 lb., on the Proteus II this figure was 3,400 lb.

The first turbine, which has circumferential rather Proteus design, is kept as the III. Bristol says that this design requires numerous stress power-because they don't have to take the prop and the turbine gas—and that the engine responds more rapidly to the throttle. Propeller speed too is adjusted by automatic power at itself and the engine, and to reduce wear during cruise, all without affecting the speed of the compressor.

Compost Unit—The Proteus, in spite of its 17 components stages and four turbine stages, is a short engine. Big part comes from the compressor in the reverse-flow design feature. Because of this, Bristol engineers were able to pack the turbine casings around the axial compressor into a small tail diameter.

Reverse flow compressors in place, considerable turning of the air between entrance and exit, and this is so for the Proteus. Reverse engine air intake and jet exhaust, the change is as the Proteus flows through 270 deg. in the plane of the thrust line.

The circumferential air intake is a

radial inlet flow below down the engine length. An outer casing to the thrust line, points through a plenum chamber and is turned 90 deg. to enter the first stage of the 17-stage axial compressor. This stage is at the eye of the compressor section and flow direction is forward through the remaining stages.

Then the air passes through the single-stage, double-shrouded centrifugal compressor. This rotates the air another 90 deg. Each stage is designed with eight different passages. Each of these leads to an elbow with bending vanes which direct the air through a right-angle angle and into the aperture end of the right through-flow section chamber.

From the downstream end of these chambers, the air flows through the four turbine stages—two for power and two to drive the compressor and the

compressor. Compressor Design—Rings section of the axial compressor is built up from 12 light alloy disks. At both ends, these disks are bolted to hollow steel shafts, and the whole assembly is held with eight tension through bolts.

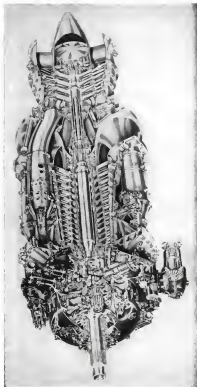
Rings and stator blades are steel on the Proteus III. Roots of the rotor blades are bolted to the steel shafts, and the whole assembly is held with eight tension through bolts.

Stator blades are still into circumferential grooves in the end halves of the compressor housing, then are locked into position by rows of wedge bolts. Between the ends of the stator blades are holes which provide bleed air for cooling the turbine wheels.

The outer Proteus tail gate is gap between axial and centrifugal compressors, the air passed through its narrow slit between compressors. Near the centrifugal unit has been located right next to the last stage of the axial compressor. This has improved performance—particularly by reducing dust losses—and reduced size and weight of the compressor.

High-pressure end of the steel unit is carried by a hub which mounts the centrifugal unit. Forward of this is a pin of a steel pin of bolt, which shaft, like the rotor shaft. And the new end of the rotor is supported in a roller bearing.

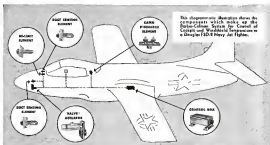
Screen and Turbine—The combustion chamber is circumferential, a gas-tight water flame tube is shrouded with an outer casing. There is a burner



Bristol Proteus Mk. 705 Turboprop Powerplant

location and arrangement from other engines in the series. The Proteus is a reverse-flow engine with a uniflow compressor. There are 17 stages of axial-flow compression followed by a single stage of centrifugal. Axial flow compressors are built up from 12 light alloy disks, at both ends, these disks are bolted to hollow steel shafts, and the whole assembly is held with eight tension through bolts. The rotor blades are steel on the Proteus III. Roots of the rotor blades are bolted to the steel shafts, and the whole assembly is held with eight tension through bolts. The outer Proteus tail gate is gap between axial and centrifugal compressors. This has improved performance—particularly by reducing dust losses—and reduced size and weight of the compressor. Burn length of the unit is 300½ in., engine diameter is 38½ in., dry weight is 2,650 lb.

This big turboprop engine, manufactured by the Bristol Aeroplane Co., Ltd., is currently under development test. Production version of the same engine will power the Bristol Britannia transport now on order for British Overseas Airways Corp. The engine is 100½ in. long, 38½ in. in diameter, and weighs 2,650 lb. It has 17 stages of axial compression followed by a single stage of centrifugal. The engine has a maximum take-off power of 4,180 hp, and a maximum cruise power of 3,400 hp. The engine is designed to last for 20,000 hours of operation. The engine is currently being tested at Filton, England, and is expected to be in production in 1955. The engine is a major development for the Bristol Aeroplane Co., Ltd., and is a major step forward in the development of turboprop engines.



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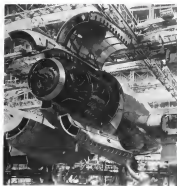
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have been used on nearly 100 major models of transport, executive, and military aircraft representing over 30 airframe manufacturers. Applications include: complete temperature control systems for cabin, cockpit, flight station, lounge, cargo, camera, and electronic compartments; temperature control of NESA and other windshield; temperature control of carburetor air, mainfold air, and oil wing and empennage deicing controls; overhead controls; trim tab positioning and synchronization controls; flap imbalance detection controls; low voltage warning controls; nose wheel steering controls; rudder boost override controls; plus miscellaneous ammeter, air valve, and Micropositioner* applications.

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at the upstream end with a marker for measured disturbance.

Sparks plugs are used in two chambers and transfer tubes carry the flame from them to the other burner cone. Both length and weight of the Proton II combustion system have been reduced.

In contrast with the Fynorsk II, the newer tank uses a two-stage turbine to drive the compressor. The single power stage of the earlier model has been replaced by a two-stage turbine in the Fynorsk III.

The turbos are of benton nitrate stainless steel blades are Nimonic 80 in slots with 6-tree software. Wheels on the turbos which drive the compressors are cooled by air tapped from the compressor.

Turbine vanes are Number 50 cast in aluminum. These are attached to the turbine casing and carry displacement and lubricant seals between each of the turbine wheels.

Turbine Details—An internal sleeve holds the first and second stages turbine wheels (during the manufacture), there are radial grooves on the mating face of the wheels. Shaft of the first stage wheel is connected to a thrust ball bearing; it is centered by a threaded con-
pling connected to the rear end of the compressor rotor.

The propeller turbine wheels are coupled together in the same manner. End support of the turbine shaft is a ball bearing in the turbine case casing. Forward of the diesel star wheel, the

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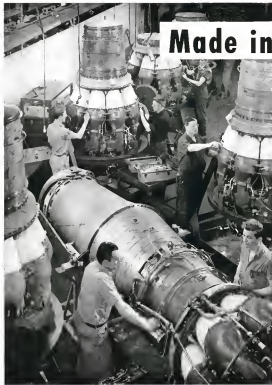
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ulates industry by providing its subcontractors an opportunity of engaging in diversified production. Finally, subcontracting helps maintain a balanced labor force by providing steady jobs even when civilian production is curbed.

This year Pratt & Whitney will pay out many millions of dollars for the products of its 5,280 subcontractors and suppliers. Some 200 of these Pratt & Whitney subcontractors have served the organization for 36 years or more. Many of them, like Pratt & Whitney, have grown tremendously during the years of working together. As Pratt & Whitney's business increases, so does its subcontractors' business increase, and this is true even in normal times.

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turbine shaft goes through the bottom nose of the compressor turbine shaft. Coupling of the turbine shaft is by a support bearing in the rear end of the prop drive shaft.

A small torqued coupling is made for larger torqued coupling between the compressor turbine and compressor rotor. The smaller end connects the propeller turbine and the propeller drive shaft below the latter passes through the compressor rotor. This system of coupling allows independent expansion of the compressor and turbine sections of the engine.

•Gearage—A compound spur gear provides about the 12,000 r.p.m. rpm of the Prtwin 80 through a ratio of 0.03. Power to the rear prop drive fair planet wheels, their traction against the outer third gear rotates the rest of the planet which around the rear wheel runs. Since the planet gear shafts are fixed in line with the flange base of the propeller shaft, the rotation of the planet wheel also drives the prop shaft around.

A propeller balance the load on the fixed gear and additionally provides a means of engine performance.

A ball bearing supports the front and a roller bearing the rear of the prop shaft and plane-cut inside.

The reduction gear is fitted with a helix which stops windmilling of the prop on the ground, this works on the high speed shaft of the driving section.

•Accessories—On the Prtwin 80 engine, the current type is called the Prtwin 705 and it is to this specific engine that the following accessory descriptions apply.

All engine accessories are located around a gear casing which is helical around the main reduction gear. Starter is on the left side and drives the compressor through bevel gears, a dog clutch and spur gear.

The compressor gas, preheater, fuel pump, reversing pump, scavenging and pressure pumps and centrifugal barrier are all driven from the compressor.

Propeller drive accessories get power from a spur gear on the rear of the propeller reduction gear cage which drives a shaft with gear train for the pump control unit. Another shaft drives an accessory gearbox through a system of bevel gears.

The pump-synchronizing alternator and the temperature pumps are also driven from the reduction gear train.

•Oil System—The main oil pump is located below the gear casing. Delivery pressure is 50 ps. From this pump, oil is fed to the metering pump—which supplies a measured quantity of oil to turbine and compressor bearings—and to the temperature pump which raises the pressure further before feeding oil to the temperature exchangers.

The main oil pump also supplies 35-ps. oil to the reduction gear and

For JETS and PROPS...



EX-CELL-O Precision PARTS

ABOVE: Typical precision aircraft parts manufactured by Ex-Cell-O. All details of assembled units were manufactured at Ex-Cell-O to customers' specifications.

For more than 20 years Ex-Cell-O has been an important parts supplier to the aircraft industry. Ex-Cell-O precision, a byword in precision-powered aircraft, has continued to play an important role in the development of jet power. Today, leading manufacturers of turboprop engines, reciprocating engines and airframes rely on Ex-Cell-O for precision parts and sub-assemblies requiring unusual accuracy and uniformity of dimensions, finish and hardness.

Since the introduction of jet-powered planes Ex-Cell-O has developed special machine tools for the volume production of compressor parts and fuel system parts and sub-assemblies, including nozzles.

Ex-Cell-O's aircraft parts production facilities are being used now in conjunction with the defense program. If you are working with this program too, perhaps Ex-Cell-O can help you.

EX-CELL-O CORPORATION

DETROIT 33, MICHIGAN



LEWIS

Standard Temperature Indicators for Aircraft

USED BY LEADING AIR LINES, THESE INDICATORS HAVE PROVEN THEIR RELIABILITY BY YEARS OF SATISFACTORY SERVICE

THERMOCOUPLE TYPE

All LEWIS thermocouple indicators are fully solid-weld constructed, completely shielded and are available for use with (iron-constantan, copper-constantan or chromel-alumel) thermocouples in all standard ranges for the thermocouple material used. A few typical ranges are listed below.

MODEL 175, 3½" case to AMO 104H
—50 to +300°C Cylinder Temp.
(AN 5556-1A or 714)
—50 to +300°C Exhaust Temp.
3 to +1000°C Exhaust Temp.

MODEL 475, 7½" case to AMO 104H
—50 to +300°C Cylinder Temp.
3 to +1000°C Exhaust Temp.

MODEL 350 dual, 7½" case to AMO 104H
—50 to +300°C Cylinder Temp.
(AN 5556-1A or 714)
—50 to +300°C Exhaust Temp.
3 to +1000°C Exhaust Temp.



MODEL 175



MODEL 475



MODEL 350



MODEL 775

RESISTANCE TYPE

Accurate indicators, these LEWIS resistance indicators are completely free of voltage error, have nearly linear scales (not crowded at the ends) and are magnetically shielded. A few typical ranges are given below. Not shown is Model 444, 2½" circle.

MODEL 475, 7½" case to AMO 104H
—75 to +350°C AN 5710-6 or AN 5710-7
3 to +1000°C Exhaust Temp.
—50 to +300°C Air Temp.

MODEL 350 dual, 7½" case to AMO 104H
—75 to +350°C AN 5710-6 or AN 5710-7
—50 to +300°C Air Temp.
3 to +1000°C Exhaust Temp.



MODEL 475



MODEL 350

FOR MORE RESULTS SEE LEWIS THERMOCOUPLES AND LEWIS GAUGES WITH THESE INDICATORS
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Manufacturers of Complete Temperature Measuring Systems for Aircraft

through a filter to the propeller pitch control system.

Oil from bearings and induction gear is returned to tank by way of the scavenging pump and an oil cooler.

►Fuel System—A Lucas variable displacement fuel pump supplies the burner via the fuel control. Altitude compensation is handled by the Lucas barometric control.

A conventional ductile cast-iron manifold the fuel, this changes the quantity of flow in the high pressure supply line to the burner.

Scavenging the engine uses an electrically driven duct pump. This ducts fuel at high pressure into the output side of the main pump which takes over when the engine is up to speed.

Compressor and air intake casings of high alloy are stressed members, and so Ingersoll has eliminated the fabricated compressor and intake casings.

The engine is re-mounted from a conventional supporting structure with eight pickup points. This way supports the engine through two steel metal cones which are attached to the compressor casing.

Guided Missile Training School

A pioneer guided missile training course has been established at Northrop Aircraft, Inc. for 90 civilian and military personnel of the U.S. Air Force.

Northrop technicians have mapped a six-month course of study in the theory, design, maintenance and repair of the guided missiles developed by Northrop for the Air Force. A specially prepared facility will handle advanced training classes in subjects at the company's Hawthorne plant.

Although all details of the course and data on the missile are being withheld on the grounds of security, there have been various reports that Northrop is developing a long-range ballistic missile.

Ryan Developing Exhaust Gas Cleaner

New job at Ryan Aeronautical Co., San Diego, includes development and test of gas concentration-reducer to remove carbon monoxide from exhaust gas so it can be used for cabin heating, anti-icing and other applications.

Company's catalytic converter—already used in jet engine exhaust systems—are now being applied to jet engine compressor which are being tested by General Electric Co.

Ryan's development lab has created first use of a hydrogen for exhaust system demands for Panavia Helicopters Corp. (contract).

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AN6210-1 and -2, AN6211-1 and -2



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AN6201, AN6211-1, AN6217 and AN6276



ADEL TYPICAL 3000 PSI, ADJUSTABLE PORT TYPE RELIEF VALVES
AN6270-4, -6 and -8



ADEL TYPICAL 1000 TO 2000 PSI CHECKING PRESSURES (THERMAL) RELIEF VALVES
AN6345AA



ADEL TYPICAL 1000 PSI, PORT TYPE CHECK VALVES
AN6247-2



ADEL TYPICAL 1000 PSI, ADJUSTABLE PORT TYPE RELIEF VALVES
AN6300-SAB and AN6300-SAB



Britain Shows New Plane Parking Device

A new aircraft parking device made in Britain is designed to give high maneuverability while the aircraft is taxiing. The unit, intended to lift the nose or tail wheel off the ground, is made by Loring Bagwell, Ltd., Birmingham, Britain, England. Components include a control head, hydraulic lift and transfer pulley to adapt ring fitting around the axle lock.

Pulleys consist of two semi-circular light alloy parts which carry brackets to fit the axle or wheel spindles of the particular plane. Several pulleys are available to fit different wheels. The operator opens the pulley with a quick-release safety, raises it to the correct height, then closes it, a quick-loaded catch locking the two halves. Height of pulley from ground allows raising of wheel with full toe.

Self-lubricated bearings support the pulley and the unit can be turned in any direction without moving the tail (or nose) wheel, so that also can be locked in fore-and-aft position if necessary.

Lowering and lifting are controlled at the handle with pushbuttons.

Convair Sets Up Executive Training

Company executives will be prepared to fill new ground roles and maintain better division positions among firms expansion, ventures, and combinations of jobs resulting from consolidation, under a new plan inaugurated at Consolidated Vehicle Aerial Corp. Convair's approach seems to qualify its own personnel better for the new jobs, boost their current efficiency, and help the company put its hands on the right men to recover the steel for it should want.

First step in the plan is to inventory the executive personnel and review the records, making studies of up-to-date status and various levels and functions in to future possible based on management advancement, life expectancy and similar factors.

Second step contemplates an analysis of all current executive positions and setting up open and standards of performance. After this, executive personnel and their positions will be compared and personnel identified, in general, with "target" jobs or areas in which they are strong.

Training will include, but will not be confined to, on-the-job coaching, in-plant and inter-plant rotations, in-plant training, university study, research and correspondence courses.

PRODUCTION



MOLD, WOULD halves are joined in combined oven-dry heat...



HALVES ARE JOINED, held together by adhesive strips...



SPRING-LOADED closing pins make the joint strong, and...



MOLD IS COMPLETE. Mold is poured through gate, right.

Shell Mold Process Casts Stainless

Large dividends are seen for process still in infancy, but greater interchange of data is necessary.

By Irving Stone

Recent progress with the shell mold process promises cheaper, better and faster production of castings for the aviation industry.

Essentially, the procedure is one in

which the molten metal is poured into thin, bonded sandless metal shells instead of the conventional heavy gray sand mold.

Details of the process were first exhibited at this company in May, 1947, by the Field Information Agency,

Technical, U. S. Department of Commerce, in FIA-7, Field Report 1168, based on data obtained in Germany. But to date little information has been exchanged between researchers who have taken up the process. Of some 5,000 females in this country, only about 200 are said to be using this casting procedure and only a fraction of these are on a production basis.

Applied to Stainless-Steel,

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MOLTEN STAINLESS STEEL at 3,100°F is poured into successive molds held in rack.



CASTINGS are left to cool. Gases escape through the permeable sand iron mold.

Cooper Alloy Foundry Co., Billado, N. J., held a patent disallowing on the shell molding technique and casting of stainless steel in shell. Cooper is a stainless steel foundry and the patented the company to see if it couldn't successfully apply that metal to the process.

It began research from scratch in August, 1959, and is now on a production basis with prototype and non-prototype parts. One of its shell mold cast products is a component for a jet engine afterburner installation, another part is an engine support fitting, which weighs about 35 lb., has casting and about 75 lb. with heads and girth. Shell mold for this unit is about 40 sq. in. with about 2 in. wall thickness.

*New To Be Learned—Cooper technicians freely admit they don't know all the answers for casting stainless with the shell mold process. But their experimental laboratory is carrying on a continuing program to ferret out the still unknowns—both on shell making and casting techniques.

As Cooper's fund of knowledge is extended it hopes to produce as ex-



DURING COOLING PROCESS, the shell is gradually heated away, so removal of the casting is a single motion. The part shown in this photograph is not an engine part—it is a gate valve.



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thousands of dollars in cost savings. When the process is adapted to the use of sand, the cost of sand is reduced to about one-tenth of the cost of the process. The cost of the process may be used by the manufacturer for competitive bidding.

Cooper's process is another big factor. When the process is adapted to the use of sand, the cost of sand is reduced to about one-tenth of the cost of the process. The cost of the process may be used by the manufacturer for competitive bidding.

The company is experimenting with various sands and additives in various quantities and is considering the use of sand pre-treated with resin instead of the curing procedure now employed.

Patent agent now used between pattern and mold is a silicone. Previously, paraffin was employed, but the process was complicated because a burned oil during the process.

Model, Pattern Factor—Model (metal) and leads (metal) have been out of the line, but Cooper is studying ways to make them smaller. The 1047 FIA.T report contained no data on leading and gating.

Setting the mold halves with adhesive strips by hand is the final answer. The operation will have to be speeded. Cooper also says the young engineers must be doing the mold off regions enough to better results.

Shell sands have a tendency to swell on the outside. Study is needed here to determine how much the water from pattern to pattern so that some common denominator may be established to control the condition on a large production basis.

Now, after a mold is ejected from its pattern, the latter must be reheated before it can be given another casting of the next piece. This reheating may be as high as 4 mm. and is considered too high a delay for optimum production efficiency. Cooper intends to experiment with firing the pattern with ring heaters to cut or eliminate the short time.

Advantages—But even though the surface of shell mold casting has just been scratched, development work, many advantages already have been established. Cooper says:

Greater tensile yield is obtained—increased casting potential with the melting capacity. This is because the amount of scrap that goes into heads, gates, runners, etc., is at least 10%. Some times that required for sand casting. And there are no rejects because of mold shifts—a problem in sand casting, particularly with small parts. The rigid shell halves can perfectly rounded and so joined that they can't be displaced. Less scrap and fewer rejects.

This pump works standing on its feet . . . or on its head



A "flame-out" in a jet pilot's Number One worry. Flame-out can occur when the pilot goes into a sudden dive, or turns the aircraft tapy-tappy . . . the fuel "falls" to the top of the tanks away from the single pump(s) element of conventional pumps, and the engine is starved.

Thompson Double-End Fuel Booster Pumps are designed specifically to supply uninterrupted fuel flow under pressure from the tank to the engine even when the aircraft is inverted or subjected to negative-gravity conditions. These pumps are now available in a range of sizes to handle fuel requirements up to 3000 gallons/ hour. The elements at either end assure continuous pickup of fuel from either the bottom or the top of the tank sump.

Pumps of this exclusive Thompson design are in regular service on current production aircraft.

Technical data and information on Thompson Double-End Fuel Booster Pumps are contained in Bulletin AD-152. Write or your company letterhead to:



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These AeroProducts turbo propellers convert the tremendous horsepower of the two Allison T-40 engines into the thrust which carries this A-bomber to its target.

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more a living in critical alleys, a good percentage of which is usually lost in a single season.

- **Placing with shell mold in drags**, there is less time between casting and moving from mold to mold with the ladle because the shells do not have the hollow space between them. This results in a closer together, overlapping only about 1/4 the space required by the latter.
- **Casting to chains** between a number of banks. This means that no reaction has to be removed by extra ladling and pouring, and, as a result, the metal is cast in a more uniform shell mold and cutoff time savings are considerable because of smaller parts, seams, rags, fins and defects.
- **Better surface finish** is obtained, and cold chills (scuff lines) are minimized because the metal doesn't shell in rapidly in the shells.
- **Cleaner and easier working conditions** are another dividend—there is a minimum of dust and the shell mold weighs about 1/10 that of the sand mold.
- **There is a higher productivity** with shell molds—they are made automatically at much faster rates than the sand mold can be turned out and in addition can be stored underneath until ready for use, thus saving considerably in the pouring operation. Making of sand molds must be synchronized with the use of the different alloys because the sand tends to dry out—the mold can't be left idle indefinitely.
- **Automated pouring** can be realized with some experience with the general equipment.

Plane Workers Tops In California

The aircraft industry in California has jumped into first place as the largest employer of labor in the state's manufacturing industries, accounting for 18% of the total production labor force.

By May there were 254,500 second wage and colored employees, according to the state industrial relations office—a new postwar high. Over the past year Childress's aircraft plants look as good as new: 50,000 workers over the past two years more than 500,000.

The new total is 51% of the World War II peak established in August, 1943.

New H-m Standard Plant

Hamilton Standard Division, United Aircraft Corp., has started production at its new 267-acre Weather Locks, Conn., plant. The division expects to be in full operation at its new facilities in August following movement from E. Hartford.

Carter pumps give
performance
plus



North America's F-86-D Sabrejet is a most formidable interceptor in the hands of Air Force pilots noted for spring steel wrists, infinite skill, and aggressivity. The General Electric jet engine gets a big power boost through the use of an afterburner. The performance and agility of this subsonic fighter hinges on the ability of a May 4-piston pump to unobtrusively deliver a large volume of fuel under extremely high pressure. A Coker designed pump does this job.

BOUMAS E-100-2. Once this plane drops from the belly of its mother ship, the homelink risk of supplying fuel and liquid oxygen to the four external rocket engines is reduced to Center turbine-driven centrifugal pump.



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PRODUCTION BRIEFING

► **Heath Airframe Corp.**, N. Y., has established wholly owned subsidiary, **Perron du Brasil, Ltda.**, São Paulo, to step up its sales and field engineering services in Brazil and southern South America. Managers of the new setup is H. B. (Tony) Sawyer.

► **General Coastal Aircraft Corp.**, Tucson, Ariz., is putting \$8.4 million to improve its North Tucson Municipal Airport base. A runway is being extended to

13,000 ft. to house B-47 to be modified by General Coastal.

► **Kaiser-Frazier Corp.**, Willow Run, Mich., has set up separate divisions and divisions, with T. A. Bedford in charge of all aviation engine and automotive projects and S. A. General handling the engine and automotive divisions.

► **Hydro-Air, Inc.**, will have its new Burbank plant in operation by Sept. 1, increasing its production area by 400%.

► **Dejor Aircraft Corp.**, L. I., N. Y., produces instruments maker, has expanded

plant space, manufacturing instruments (see items 1, Arms & Aviation, 200 motor, Wm. B. C. Dadd, Rosely Hills, Calif.; Wilson E. Ruggies, Chicago, Ill.; Remco Co., San Francisco; John E. Morris Co., Kansas City, Mo.; W. Henry Conroy, Philadelphia).

► **Loose Laboratories, Inc.**, Huntington, L. I., N. Y., is showing research and development activities in the use of reinforced plastics in substitutes for metal-to-metal materials. Specialized reinforced plastic products under has looking exceeding \$1 million.

► **Lescage Airplane Corp.**, has started second phase of \$150,000 improvement program at its Grubbs, Tex., factory, designed to increase available floor space by 300%. Completion is expected by Sept. 1.

► **Mississippi Honeywell Corp.**, Aero nuclear division, Mississippi, Miss., has established a new production wing in Houston, particularly designed to carry out a servo-mechanization program.

► **Lockheed Aircraft Corp.** plant to move all final assembly from the B-47 production jet program from Burbank plant B-1 to a new 513-million factory at the proposed Palmdale, Calif., jet center. Production at Palmdale is expected to begin about March, 1957, with approximately 638 employees. Indications are that T-33 jet trainer final assembly will be transferred from Van Nuys to Palmdale by the end of next year.

► **Ryan Aeronautical Co.**, San Diego, has received a contract for master manufacturing to the design of Aerojet Engineering Corp. (AEC) has been awarded new orders for engine systems totaling more than \$4 million, with a major portion being for the Douglas C-124 Globemaster. The firm's direct contracts are running more than \$2.5 million annually.

Midwest AF Orders Top \$3 Billion

Midwestern prime contractors now hold more than \$3 billion in USAF orders. The value of Air Force contracts in the close state Midwest Air Procurement District have nearly doubled in the past year and are now at a peak since World War II.

The District's composite is paying out more than \$10 million monthly for completed goods. More than two-thirds of the contracts held in this district are in the hands of firms employing fewer than 500 people with more than 50% of the dollar value going to such companies.

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GOODYEAR BUILDING INS. SECTIONS

Workers put on the folding touches to a complete fuselage section of the Fawcett H21 Workhorse in the Cessna Aircraft Corp. plant at Akron, Ohio. The company

is building three hangar shells and landing gear for F-16s under subcontract, with work scheduled to run well into next year. Navy requires workbooks around costs.

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AVIONICS

New AF Gyro Gets Avionics Assist

Greatly improved accuracy claimed for Lear artificial horizon; gyros are remotely positioned from indicator.

By Philip Klum

Grand Rapids, Mich.—The pilot's pitch and bank indicator, originally a single artificial gyro, later a motor-driven gyro, is now a sophisticated automatic device complete with vacuum tubes and servos. Lear Inc. is producing the extremely accurate AF artificial horizon for use on USAF's B-47s, B-36s, F-96s, and F-105s.

In flight the 5-in. diameter horizon indicator behaves as if it contained a gyro, but it doesn't. The gyro element is located in a remote control unit (the better accuracy), and transmits its pitch attitude information electrically to the panel indicator.

In terms for its increased weight and complexity, the USAF is getting a compact non-tumbling horizon gyro with:

- Much improved accuracy (within 1/10 deg of apparent vertical in level flight)
- Greatly reduced "zero creep"
- Amplified pitch rate near the horizon
- Combined yaw and roll-type horizon presentation

■ Gyro Element—Heart of the system is the vertical gyro which is gimbaled (supported) in unlimited gyro freedom about the roll axis and with special stops set at ± 35 deg. pitch angle. If the plane maneuvers beyond 35 deg. in pitch—for example a loop—the gyro hits the stops, causing it to do a controlled "flip-flop" about the roll axis, which returns the gyro to the correct attitude.

Certain types of non-linear rolling behavior, common in combat, can result in a small attitude error (up to 7 deg.) on completion of the maneuver. However, this error is quickly corrected out by the existing system.

The gyro motor operates at approximately 24,000 rpm. (low motor slip) and has an angular momentum of almost 1,000,000 gm. cm. sec.². It is basically the same as the USAF's F-5 autopilot vertical gyro. This permits manufacturing common and even reduces supply problems.

■ Gyro Erection—Vertical gyro erector on erection system in prevents the gyro from ever from "drifting." Lear has a small carbon pitch attached to the gyro element to sense when the gyro



LEAR's vertical horizon indicator for USAF looks and behaves as if it contained a vertical gyro, but it doesn't.



GYRO and associated erector are in this remotely located control unit for better accuracy.



HORIZON INDICATOR easily shows two zero errors, but no gyro.

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Representative: National Instrument and Control Corp.
P.O. Box 1000, Los Angeles, Calif. 90001



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THE FIRST FULL-MANEUVERING AUTOPILOT produced in quantity FOR JET FIGHTER APPLICATION, THE LEAR F-5 AUTOPILOT is considerably lighter in weight than its predecessors. It incorporates coordinated turn and pitch maneuvering with attitude angles up to 50 degrees. Addition of the Lear Automatic Approach Coupler permits automatic approach to landing fields on ILS beams, and provides for automatic altitude control.

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For Details write **FLIGHT REFUELING INC.** Danbury, Conn.

THE YEAR CONTINUOUS RESEARCH AND DEVELOPMENT ON PRESSURE FUELING SYSTEMS AND EQUIPMENT

gives gas flow to diverge from the vertical. It functions somewhat like two capacitors' leads not at right angles to each other.

The revision switch is a small circular capsule whose slightly curved base contains a center radial contact and whose top plate has four radial contacts displaced 90 deg. from each other around the outer edge. The capsule is filled, but not completely, with a special Less-developed electrolytic liquid which will pass current from the base contact to the four top-plate contacts.

The revision switch is mounted to the underside of the gyro so that two of its outer contacts are aligned with the roll axis, the other two with the pitch axis. If the gyro goes into a truly vertical (aligned with the apparent direction of gravity), the switch will be level. A voltage applied to the center contact will then cause equal currents to flow from each of the two pitch contacts, also from each of the two roll contacts.

If, however, the gyro is tilted slightly, say about its pitch axis, the electrolytic solution flows into the low side of the switch (as in a capacitor's level). This increases the current flowing from one pitch axis contact and reduces the current flowing from the other.

► **Electric Motor-Each arm of the gyro has a 2-phase a.c. torque motor and to return the gyro into the vertical should it start to drift. Because of the cross-coupled gyro precession characteristics, the pitch axis torque motor actually applies torque about the roll axis to shift the gyro's pitch axis, and similarly for roll-axis movement.**

When equal currents flow from each of the two pitch (or roll) contacts on the revision switch, the reaction causes the gyro to rotate about its torque. Should the gyro axis depart slightly from the vertical, the imbalance in reaction switch currents causes the appropriate reaction motor to apply a torque in the proper direction to return the axis to vertical.

An electrolytic-type reaction switch is used in the Sperry A-82 vertical gyro's cross bundle sufficiently large one can to consider the reaction motion directly. This characterizes the need for an intermediate stage of electronic amplification.

In concept, the reaction switch is a simple device. But it has given Less more headaches. One big problem was to find an electrolytic solution which could handle relatively large currents (65 ma.) without breaking down as deteriorating with age. Less says that 1,600 hr. life tests on the present production switches have not disclosed any aging effects.

► **Reducing Turn Errors-When an airplane goes into a turn, centrifugal force**



LONG ERECTION switch developed by Less detects apparent direction of gravity and operates gyro reaction motors.

acts upon the reaction switch liquid (in other gravity sensing element) to cause a "false vertical." Unless the reaction switch is cut off, the reaction motor will try to align the gyro tips axis to this false vertical position, causing an error in attitude indication.

Most previously used pneumatic reaction gyros were not designed to cut off roll axis reaction during turns. As a result they gave large "turn errors," particularly when used in high-speed aircraft. Less has hit upon a clever magnetic solution to this problem.

When the airplane's rate of turn exceeds 40 deg./min., the roll axis reaction motor is cut from the roll axis contacts on the revision switch and is connected in parallel with the pitch reaction motor across the pitch axis contacts of the revision switch.

That's why Less says the gyro's roll axis is the pitch axis reference instead of merely return of roll axis during turns. When an airplane turns, it is either rotating about the spin axis or its vertical gyro. Thus any gyro tilt which existed as the roll axis will appear to a pitch axis tilt at the completion of a 90 deg. turn.

When a plane goes into a turn, the gyro roll axis may be tilted slightly off centered before the revision is cut off its switches. When it returns to the turn happens to be a 90 deg. turn, the tilt will end up as a pitch axis tilt and must be taken out by the pitch reaction motor after the turn is completed. Why not, Less reasons, immediately connect the roll axis reaction motor to the pitch one of the reaction switch? And if the maneuver happens to be a 180 or 540 deg. turn, the gyro is so much off that if roll axis reaction had simply been cut off.

Hard to Moscow-Now legs as the turn errors in the new Less device? As gyro assemblies go up, it gets more difficult to obtain a quantity

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Joy offers a wide selection of standard single or two-stage aircraft fans, as well as custom-designed types, for all ventilating, heating or cooling problems on military and commercial planes. Optional features include straight or flared inlets, hinged or flanged connections, radial noise filters, soundproofing, and cooled access when required.

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Tape Resistor

Improved by NBS

A new version of the tape resistor which National Bureau of Standards developed in 1951 (Aeronautics Week July 7, 1951, p. 34) for conventional aircraft equipment uses expensive wire bonding after being wired into the circuit.

The NBS resistor consists of a 4-in.-wide resistor paper type 1 in. long with a resistive coating on one side and an adhesive coating on the other. The tape resistor was originally designed to be

pressed into place between two metallic terminals in a wirebonded electronic circuit.

Compliance developed because the tape resistor then had to be fastened at a temperature of 100C to bond it in place. Many other components in the circuit couldn't withstand such high temperatures.

The NBS solution is to make resistor "underlayer" by joining twisted resistor tape against both sides of a metallic wire or metal ribbon which provides "leads" for the wiring. These units are then given the heat cure to bond the tape to the lead wire or ribbon. Afterward, the resistor leads may be soldered or spot welded in the circuit.

One remaining problem is that of heat dissipation of the tape resistor's rated 1 watt at its design temperature of 200C, when supported in air by its leads. NBS is working out methods during curves because of this present shortcoming.

Australian VAR Range

(McGraw-Hill World News)

Melbourne—A 30-station, \$2.7-billion visual-range radar range is getting the finishing touches from the Australian Civil Aviation Dept. prior to operation, which is expected in an early date. Technicians now are concentrating on the radar beacon system allowing the VAR to be used also for instrument landings.



FLYING COMMUNICATORS LAB

This is one of two C-47s which Standard Research Institute, under military sponsorship, is using to investigate language communication problems in aircraft. Work includes developing techniques which per-

mit portions of cockpit dialogue to appear to occur in a VHF antenna. Note that Mark Dietrich (last) on the radio station (above) which electrically isolates the key antenna functioning portion of the fa-



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Mag Modulator For Servo Systems

A small magnetic modulator designed to convert d.c. signals into 400-cps signals of corresponding amplitude and phase-angle for use in servo systems, has been developed by General Magneto, Inc.

Weighing only 4 oz., the modulator, designated MM-502, operates over a wide frequency range of —55C to +100C. The unit is accurately rated to MIL-T-27 requirements, and is said to have an operating life of more than 10,000 hr.

General Magneto says that standard off error due to hysteresis will not exceed 0.8 milliradians for a d.c. signal (current) of 50 microamps. Input resistance is 1,600 ohms; output impedance is 14,000 ohms. Output signal voltage is 55 vdc for a 40 microamps input signal. Hysteresis distortion is less than 10% for outputs above 0.1 v., according to the manufacturer of the modulator.

General Magneto, Inc., 135 E. Broad St., Bloomfield, N. J.



RECORDS TESTS

Small British war recorder designed for use in the cockpit to record test pilot's statements on the report machine is manufactured by West Electronics Ltd. (Aviation Week, May 21, 1951, p. 65). Recorder weighs 14 lb and requires only 1 amp at 25 v. Unit has 60 min. recording time and frequency response of 300-500 cps.



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4

Tactical Jets Prove Ruggedness in Battle

- The book is tossed away to keep them flying.
- F-80, F-84 equipment takes heavy pounding.

By George L. Christian

Fighters-Bombers Inc., F4E, Korea—F-80s, standing off this field today are lagging two 2,000 lb. bombs, one under each wing. These plus full wingtip tanks and maximum camouflage, bring the steady fighter's weight over 19,000 lb.—more than 5,000 lb. above the ship's rated maximum take off limit. Despite the overload, compounded by obstacles of dust and dirt, rough runways and rougher schedules, a negligible percentage of planes show a scratch and a larger number count back.

At a nearby base, late-model F-84s are also bearing huge loads of destruction to the enemy. This reporter watched planes also plane with 500-lb. bombs, plus rockets, knock down enemy airways and lumber into the air to the batteries pop and hiss of base. Keto tactics. This particular day was rain with no wind to blow away the white Keto clouds hanging over the end of the runway. So the first steps to take off laid their bottles to the last second to leave the runway as far down the runway as possible.

Each succeeding pilot discharged but just a little ahead of his predecessor. As the cloud gradually caught further and further back along the strip, the last F-84s were barreling through the dense fog at a 350 mph clip, taking all blind. Every plane entered and the only clearance was a dark leading edge where a rocket had snatched and shot vertically into the air.

► **Overweight Take-Off**—Overweight take-offs are taking their toll of both F-80s and F-84s. On the F-84, the wing change rate is high because of the excessive loads imposed on the structure by the combination of heavy loads and rough runways.

A somewhat different problem exists at the F-80 base. To keep loading gun shock away from hot landing during take and takeoff when the aircraft is fully certified with 2,000 lb. of bombs and full weapons, the crew has to be pumped up. When the ship returns from its mission unless the bombs and with tanks to the plane's relatively light. When the speed jet dip down



NAPALM TANK with every bomb left wing of F-80 coming in to attack supply building and vehicles. Napalm tank is indicated by faint white tail ending in extended black marking in F-80's right wing from gun position at head of tank.

on the runway the shock starts, is noted for the heavy loads, one stiff and exploding, imposed severe loads on the strut, attachment fittings and wing.

► **Rocket** The squadron Magnesiums all came gun shots every 100 ft and 500 ft are required. Rejection rate of the men

got wing attachment fitting was quoted at 75%.

► **Gun Location**—Another result of hanging heavy loads on the wing is that, when lighting down the landing gear, a perceptible drop appears outward of the landing gear.

Only after delivery the wing's engineering officer could master coordinated maintenance location. The gun on the F-80, placed directly ahead of the two shock engine air intake, since powder guns to be racked in, unloading the air intake and driving up the engine.

Also, special maintenance tanks and shell cases give the wing's leading edge a terrific beating. Occasionally a drop piece will fall into the wing and reach the plenum chamber before being stopped by the engine's protective screen.

► **Thunderbolt Activity**—The long-legged F-84 operates from fields tucked further behind the lines than their F-80 brethren. And, although a new runway is rapidly approaching completion, the F-84s are stranded by ground plating steps on each takeoff and landing.

As a group, F-84 pilots are probably



F-84 TITANK was well hit by huge shell which apparently exploded inside.



LEADING EDGE of member F-84 was blown away by direct hit, but plane returned.



WING badly damaged without ill effect.

the most enthusiastic about the terrific beating their planes are able to absorb. The accompanying pictures tell why. But one of the worst of them all was an F-84 in which a 48 mm shell exploded directly ahead of the pilot's frontal screen plate. The rest of the plane was almost blown off, but the pilot brought it in to a belly landing. Some of the men conceded that some "bottle damage" was caused by their own bomb bays.

Although serious, Bats get off the ground with a full load, the F-84s are not as hard on them as they can be. They can absorb more higher than earlier models. Another bonus the pilots have is the F-84 is no heavier enemy, get some cockpit and conductable air conditioning.

The F-84s, as the F-80s, also are being greatly. A squadron spokesman said that average time on his planes is approximately 750 hr, with some record-

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They tell it from the observations of the U.S. Air Force. Scorpion handles F-84 in a surprising amount of the various has guaranteed for jet power. Refrasil handles one and in the F-84's (insulation) because they can light weight and are easily removable as well as high in resistance. Refrasil is a thin but thickness of one half inch a temperature drop of approximately 100° F is accomplished! Therefore, the new Refrasil Lightweight Resin side insulation. Reduces air conditioning 50% of jet aircraft engines.



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The Old Saufa

I was listening to the engineering officer pass out his tale of woe about having to keep a full squadron of jet fighters in the air with little more than 50% of the annual complement of maintenance personnel. The last chart, in old time, weather-borne man request snuffed into the office, his hands thrust deep in his covered pockets. "See," he said, "we have just been assigned seven additional men."

The lieutenant beamed. "Know what those 50% is," grunted the sergeant, "propeller specialists"—G.L.C.

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Whenever the combination of strength and light weight are a design necessity, look at magnesium. Recent technical advances in alloying, fabricating and finishing have made magnesium a leading metal for aircraft construction.

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ing (14,000 lb. in.) into the plane's engine to combine with its opposite side, loss of efficiency.

Among the Low-Ground crew like the unusual actions of the 1-hour jet. Sample comments were that it worked well, was easily accessible and easily retracted. They added that, relatively speaking, constant access to the engine was one of the good features of the airplane. Exception was engine access. You had to pull the P-34's tail all to get at them, and Accessory was hidden up well, according to the men on the line.

►Tiptank Trouble—It is also having fair share of tip-tank trouble, but of a different sort than other jets. Main tankers personnel complained that some tanks made him feel which are used several degrees in diameter. Other problems were attachment difficulties and leaks.

And empty tanks give the men quite a struggle. Subjected to extremes of temperature and pressure, they require replacement at 30-15 lb. intervals which puts quite a load on an already overworked ground crew, whose usual working day starts at 5 am and ends at 9 pm, seven days a week.

Ground crew technicians are going out of commission in spite of that, reports which have already been included. Frequently, when the rough and tumble treatment they are given is damaging for the relatively delicate mechanism.

As it most jet squadron boys, pilots and maintenance personnel also speak favorably of the "excellent job" the Borden had control was having in.

►The Edo—One of the most rapid side components in a jet fighter, the Edo's one opening of several hydraulic steps, are the tank 32 a set moves 12-15 degrees in a wing well. One make that goes 1-4 degrees less than average was considered satisfactory.

The Ground crew are holding up very well and giving excellent service in spite of hard shore shipping, the 150 mph landing of the 54 on relatively short runways. The next require little maintenance (spare parts).

►Rich Men—At this time, as at the other two companies, most of the men have been working in the back of the plane as an unskilled high level. The pilots went to combat with the acceleration of a bomber and the ground crew learned long hours to keep the plane in top tip condition. As each flight returned, you could see them "fired" up at the extremely moving out their plane's return. And they are greatly undermanned. One squadron had only 60% of its normal complement of maintenance personnel.

As we left the base in a battered Tripp C-47, one of whose emergency exits blew open during flight but did

not even cause a slight dip among the crew's as control over the machine, impression that the boys in Korea are doing our fellow ground job by maintaining us against the isolated and grueling work for such base.

Fuel Tank Nut Sealer Gains Favor

Granville, Calif.—A new method of sealing aircraft wing tank nut, bolt and flange joints is rapidly gaining favor in aviation circles.

Calof Seal Caps, the device is being used by the thousands on B-16 aircraft,

according to the manufacturer, Pro-Seal Research Co. And Lockheed Aircraft Division, one of the company's largest tank sealing operations, has ordered 15,000 lbs. of the Seal Caps.

Seal Caps are pre-molded caps which are half filled with a sealing compound (Inventor P.S. 150118) is recommended by the United States Department of the Interior providing into the fuel tank and prevent down leaks to start or properly. Excess solvent escapes through a small hole in the top of the cap and around the base. Manufacturer's procedure is to install excess material solvent to form a smooth fillet around the cap's base. After curing, a bond

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out of (P) 60 is applied over entire cap and around base.

Advantages claimed for the device by the maker are:

- Tank tightness is increased. Use of Seal Caps eliminates air pockets which are difficult to avoid when using the brush and fillet type of sealant application. Uniformity of results may be expected because of the simple and direct method of sealing.

- Leakable areas are given the same treatment as cap-to-tank locations. There is no longer any question of inaccessible portions of a tank getting neglected because of the welder's inability to reach all fasteners to be sealed.

- Money is saved because of ease and speed of application. Seal Caps are money on original installation as well as on reworking jobs.

- Weight is reduced, especially on large tank applications, because less sealant is required to cover the many close areas of leakage found in modern fuel tanks. Gasoline payoffs and increased operating economies will result, according to the manufacturer. And, because of tighter tanks, overhaul periods are extended and maintenance costs reduced.

- Sealing time is cut. Use of Seal Caps is more rapid than brush building method. And being easier, it does not require as much know-how of the welder, therefore less skilled labor may be used.

Product Research is known to many U. S. and foreign carriers as the manufacturer of integral fuel tank systems and all mid-fuselage sections. The company is located at 5825 San Francisco Road, Glendale, Calif.



Senses Fuel Flow

A new photoelectric sensing system for detecting presence or absence of liquid in a line, tube or pipe has been developed by Wm. R. Whittaker Co., Ltd. Developed primarily for aircraft use, the "range eye" device can be adapted for any application where instantaneous indication of change of flow in a line is desirable.

The system places no obstruction in the line and uses no moving parts. The sensing unit, which serves as a part of the line, has a reflecting cylindrical glass

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William A. Merchant, Chief Pilot
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built into one wall. Pressure is absorbed by liquid instead of causing an absorption in a path of light between the pump and a set of photovoltaic cells on the opposite wall, and the message is relayed through a control box to the cockpit or other control panel.

The new sensing system operates in short, low fuel level warning, indicates complete fuel transfer, assures correct fuel system operation and assures valves in pumps in an automatic liquid system, the company states. It can operate with any kind of fuel system, liquid or solid, and is available in 100 psi, and it can even indicate the amount of fueling in fuel systems.

Sample costs are available for operation tests. W. A. K. Whitaker Co., Ltd., 905 No. Olsen Ave., Los Angeles 34, Calif.

More Lead From Ethyl

To broaden the scope of vehicles in this country, Ethyl Corp. is getting into operation immediately a new plant which will increase by about 4 the firm's output of tetraethyl lead. Ethyl, who accounts to the product line with tetraethyl, also produces in 1973, liquid lead products of from 6 to 200 psi, and it can even indicate the amount of fueling in fuel systems.

Mobile Fuel Hydrant Getting AF Tests

A mobile hydrant for refueling of airports features some improvements over previous types, according to its developer, Henson Equipment Co. It has been tested in Wright field for evaluation.

The hydrant is designed to replace trucks, yet retain much of the flexibility of those units. It can move about on the spot, meaning the need for exact positioning of aircraft, as would be required in jet refueling.



Some other innovations claimed for the hydrant:

- Swivel mounting for hose application and "Y" permitting easier handling of hose and compact storage not only of 24 in. hoses, but of 3 in. hose extension as well.
- For economy and safety, two-flow shut-off valves on the several permit connection of a single pump to several hoses refueling without loss of fuel during the process.

The hose assembly consists of two 75 ft hoses of 24-in. diameter, both connected to a 10-ft length of 1-in. hose through the metal connection. The entire assembly can be drawn off the reel for single point refueling. Each of the small hoses has its own reel and can be retracted independently or unrolled coiled with the other, the reels operating separately or together as desired by the operator.

When used in one unit, the larger run of the reels form a sort of third reel in the middle which acts as a draw for the big two, hose which the operator reels from first.

The reel takes a load off the refueling operator as it permits the 75-in. hoses to be partially fed while the 1-in. hose is reeled in, thereby spreading the refueling connection in the plane.

Henson Equipment Co., 1605 E. Olympic Blvd., Los Angeles 23, Calif.

Overhaul Stretched

California Central Airlines reports CAA has increased the number of operating hours between overhauls of its R3600-GA-11 engines used on its 140 to 200 ft from 1,100 to 1,200 hr. The requirement when the company first put the 200 ft transport planes in service was 1,000.

New Flexible Sealing... T-J AIR CYLINDER

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7. Cushion filter reduces cushion contamination.
8. "O" ring, must seal.
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10. Fine cushion adjustment.
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Busy aircraft get a virtual "second wind" at TEMCO's overhaul division at Majors Field, Greenville, Texas. At a steadily increasing pace, TEMCO-Greenville is performing major overhaul and reconditioning work on both military and commercial aircraft.

Established in July, 1951, to integrate overhaul facilities and make room for increased manufacturing operations at the Dallas plant, TEMCO-Greenville, with assembly-line techniques, is currently reconditioning C-54's for the Air Force and modifying an entire fleet of Martin airliners for Pioneer Airlines.

The expansion of this activity is characteristic of TEMCO's rapid over-all development into a major aircraft producer.



FINANCIAL Copter Earnings Show Strength

Shift from design and development stage to production shows up in incomes, but gain is at slow pace.

Considerable progress in the production volume of helicopters is being reflected in earnings in this field, but at a much lower rate of gain.

This is demonstrated by the annual report just released by Puseall Helicopter Corp., Morton, Pa. Sales of \$26.4 million in 1951 compared with \$6.5 million shows for 1950, a gain of more than 400%. Net earnings after taxes, however, increased less than 68%, from \$150,497 to \$218,550 during the same period.

The gain in Puseall's sales reflects the company's shift from a design and development group to a producer or producer. The rapid progress in deliveries can be measured by viewing the sales volume during recent years. As reported in 1946, total sales aggregated but \$1,148,889 which was outstanding at it represented almost double the volume of \$652,527 reported for 1945.

Contract Lease-Net operating income for 1951, although at a new level of \$1,095,656, would have been increased were it not for losses sustained on two expensive type level gear contracts negotiated before Korea. Further, almost cost of about \$480,000 took a heavy toll of earnings. This was the price paid for the large amount of borrowed capital required to finance rising production volume and facility expansion.

For 1951 Puseall was in the assets profits but area with an effective overall net rate of around 68%. Net income before taxes amounted to \$695,570 last year compared to \$165,497 reported for 1950. Net earnings of \$218,550 reported for 1951 have not made time until the reorganization process has been completed for 1950.

Considerable division of the Puseall report has taken place as a result of the broad ownership of 1,000,000 convertible debentures, creating 11,000 shares of the old stock. A 100% stock dividend in May 16, 1951, nearly doubled the number of shares outstanding. As a result there were 218,550 shares outstanding at the 1951 year end compared with only 150,497 a year earlier. This has made the increase in per share earnings, less than 45 cents in 1951 over 77 cents in 1950.

Rolling Up—Rolling up of unfiled or due was not reported at \$150 million in 1950 compared to \$68 million at the 1949

year-end. This large volume of business has necessitated substantial expansion and attendant financing. To acquire and construct new plant facilities the company is now looking for equity. This is \$25,000 from the Reconstruction Finance Corp. and the other is a \$15 million stock issue from the government under the Defense Production Act. Both issues provide for rapid re-investment through usual payments.

The large loss is based to a number of necessary moving facilities new under construction. Previous investments up to 75% of the cost of the new plant construction is involved. The estimated total cost of the new facilities is \$11 million to about \$5.4 million. Last year half of this program was completed at the 1951 year-end. It is observed that the accelerated construction will increase the level of depreciation charges within the period immediately ahead.

Working capital decreased \$115,765 to \$716,335 at Dec. 31, 1951, and is due to the investment of such funds in fixed assets to supplement the expansion program being financed with borrowed capital. Not much has shown in working capital increase throughout the year. At the 1951 year end, this equity aggregated \$1,662,878, up from the \$1,120,749 a year earlier. This represents substantial progress from the net equity position of only \$15,350 reported at the 1945 year-end when the company was just about getting underway. On a per share basis, the common stock now has a book value of around \$5.

Market Value—Current market quotations for Puseall are hovering around \$25 per share, indicating a total market valuation for the company's equity of around \$5 million. It is likely to report that more than 15 months ago, while Puseall prepared for aggregated output, the total market valuation of its equity or net worth was placed at about \$5.5 million. Moreover, the value was around \$3.4 million. The disparities of these developments were noted in the space at that time (Aviation Week, Jan. 22, 1951).

It was then noted. There is little doubt that the helicopter has had the explosive imagination as well as new industries with untold growth potential, there is absolutely no relationship

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between prevailing market quotations and current investment value and not only. Market quotations of any given time, represent a projection discounting future prospects. As time progresses, even at slower perspectives, market quotations are quick to adjust accordingly.

Passive experience fully demonstrates the practical facts of life on the investment approach to growth industries and situations. Certainly, the company is in a much more established and stronger position today than it was 15 months ago. However, the market value of its equity is less.

■ **Mark Robb Reservoir**—The company is considered one of the major helicopter builders in the country and is well established with more advanced and larger models in serial production and with other developments constantly going forward. Considerable work has now been received from the Russian parties and more recent investment relationships are beginning to emerge for its equity.

Other lines are emerging in the helicopter field, and are demonstrating that ability not only to survive but to become a permanent part of the industry. One such company is Denon Helicopters, Inc., Dublin, Conn. During the past quarter alone its helicopter shares were two years ago, the common stock of this company was traded in the over-the-counter market at around \$4.00 per share. The company has since obtained an order from the Army Field Forces for its 12-5 helicopter and for five more vehicles in its composite structure now than it did in the past. Yet, within the year, when a limited number of additional common stock was made, the offering was at \$17.50 per share. Current quotations are around \$3.00 per share.

As with all enterprises, once their position becomes established, the investment less remains in the ability to produce a given volume of sales and the earnings that will develop as a result. The helicopter companies will follow the same pattern.

—Selig Altschul



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Pilots, ATA Favor Centerline Lighting

- Two groups are unanimous in urging CAA to go ahead, but Air Force and Navy ping for their own plans.
- CAA officials still remain indecisive after five years of extensive study of airport approach systems.

- Rail guidance to help the pilots fly straight and level, or make curving turns safely.
- Distance information—how far to the runway threshold?
- Perspective rack that the pilot knows the altitude, height and direction of his plane.

• Threshold marker installation—so the transition from approach to landing becomes a smooth and safe.

• Report is Unofficial—The few CAA officials who have seen the new look report an improvement about their operations—on track to meet out that after all "the report has no official status, it's just the recommendation of these men," although its conclusion has the full backing of all U.S. pilots and airlines.

Deputy CAA Administrator Lee haden's view the report but told Aviation Week that the airlines do not mean there is still going to be considerable further study and discussion before CAA adopts a standard if it ever does. The new CAA could go ahead and standardize all civil airport approach systems on a system approved by the airlines. But by then the Civil Aeronautics Act does give CAA "inexpedient" for military operational safety on civil airports and at civil air ports.

It is doubtful if CAA will ever decide to go ahead on its own, either then or in future agreement. Lee said there is some hope that a tentative position with recommendations might be arrived at before the ICAO conference. He says that military use of civil airports is not

Approaches are straightened.

As far as a five-year study of formal and informal conditions of airport approach lighting has been submitted to CAA Administrator Charles Hovey. This one shows unanimous and pilot support of the centerline system after extensive flight tests, as was expected. Also to be expected, Navy and Air Force disagree—each plugging for some other idea.

CAA had hoped this evolution, one dictated by Hovey's report, would at last decide a standard system as late for the International Civil Aviation Organization conference at Montreal starting Oct. 21. All airlines except the U.S. were ready to vote unless on conference at last year's ICAO conference.

Both the Air Line Pilots Assn. and the Air Transport Assn. are putting heavy pressure on CAA now to go ahead and come out for a centerline standard. But CAA's officials, from Administrator Hovey and Deputy Administrator Fred Lee, on down to the staff and the air mail industry.

Navigation Systems—This industry, coupled with CAA's late military opposition, may mean five more years of saying type installations—were though swift experts agree that there are no more than a simple standard a better than working five more years for something slightly better.

Most CAA installations are in the form of a left hand set of landing lights to the side of the runway. CAA has also installed straight at various airports this is a V shaped pattern leading into the runway axis. And CAA installed a centerline system at various airports—attitudes for evaluation at New York Airport. The British have long used on the Calcutta version of centerline. And the French had an old left-hand row and line center but have now adopted centerline.

In the new CAA-sponsored evolution by a five-man committee the CAA representative, Art Jenkins, wrote the report forcing standard, and it was discussed by the Air Force, Ernest Cebal and the ATA's John G.D.

• Dismissed—But Navy and Air Force

members were discussing letters, claiming that the evidence is inconclusive, the evolution is for tomorrow type flying only, and Navy and Air Force always are concerned to offer separately anyway. They have settled on a standard, Air Force won't allow any system that intrudes on the already 1,600 ft. maximum extension beyond the runway.

So the act, evolution report submitted to Hovey generally reveals what everybody has known for two years or more, namely airline pilots and other aviation operators should unanimously favor the centerline system. Navy pilots and engineers from the discipline, Air Force "line-up" disagree prohibitively, until reliable records or retractable lighting systems are developed.

• Pilot's Report—The new report is based on an opinionnaire airline pilot evaluation of actual landing approaches made on each of the different systems during last winter.

Their reports are tallied on the basis of the relative frequency of the system is rigid to an basic requirements.

• Identification of the system makes fairly distinct from other lights around the plane.

• Alignment with the runway (approach) is straightened.



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Airline Accidents in 1951

Type	No. Accidents	No. Aircraft involved	No. Fatal Accidents	No. Fatal Passengers	No. Fatal Crew	No. Fatal Ground
Commercial	50	15	25	142	34	3
Domestic	12	5	8	1	9	0
Scheduled	28*	15	11	7	15	0
Unscheduled	3*	1	0	0	0	0
General	3	5	12	4	15	0
Transport	2*	1	0	0	0	0
Private	2*	1	0	0	0	0
Total	116*	41	43	164	41	3

* Includes and excludes certain flights (includes accounts for total accident figures of 116. While total accidents by type carrier is 115, two types figured in one accident. Excludes plane involved in collision, loaded only.

Source: CAA, Bureau of Safety Investigation.



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ATLANTIC WEEK, July 16, 1992

LETTERS

Robinson Break-Even

We appreciate the complete coverage in your June 9 issue of our presentation for ten-year certificate renewal in and argument before the Board.

However, net break-even real pay (net for the year 1981) was only 11.5¢ per acre in place and flow. The 80¢ per acre real pay to which you refer is your story, although actually received in 1981, was a revenue adjustment covering an amount that was contributed before us, by Lewis (1982).

One actual head-even more has decreased from 51¢ per mile to 49¢ per mile, a 4% drop. The year of continued optimism is 51¢ per mile in the third quarter, year of apoplexy. 1977's break even would make 1976's death among the best of the worst.

REINHOLD E. PEACH
Executive Vice President
Kalamazoo Industries Corp.
Bloom, N. Y.

Accident Reports

We with no experts our appreciation of your article hanging to light by C. A. S reports the cases of airline accidents. You should go one step further and give reports on serious accidents involving private planes, which are obscured by bad reporting by our newspapers.

WALT A. FRANKS
B. J. Dotts Construction Company
6885 West Boulevard
Sacramento 5, California

Ryan & Ceramics

It is no way detract from the work being done by an antenna farm but in the interest of keeping the record straight, it appears that the article on common sense which appeared on Page 10 of *ANYMORE WARS*, June 9, contains a number of mis-

For example, the opening paragraph which states that "high temperature coatings have left the laboratory and are now to be applied on a production basis" implies there has been no production in the past. As a matter of fact, ceramic coatings left the laboratory July 15 months ago and have since been applied by Kera-Aermetec Co. California Metal Finishing Co. (Therm-Cermet), on a production basis.

For the past six months Ryan Coates has been crisscross coating on the average approximately 12,000 cubic yards and jet engine components parts per month. Ryan Coates production advanced to a full scale program in January, 1981, long before most of his competitors in the field did any crisscross coating whatever except on a hot experimental basis.

The Ryan-Cairns program got into full swing when, in connection with Boeing Aircraft Co., we began converting all Ryan exhaust systems for Pan American, United, Northwest, and BOAC Superjets to ensure engine flexibility. Currently, 6,975, 8,135,

C119's and Cerveo 140's are being converted to Ryan ceramic coated systems. All of American Airlines' Cerveo 140's will, in the very near future, be equipped with Ryan ceramic coated exhaust systems.

Following experimental work conducted some time ago, Nyn Caputo is now going all in that veggie production line, growing all 91 organic microconcentrated dionides.

To the best of our knowledge, *Form Cores*, by a wide margin, has the most high temperature aircraft engine coating applications than all other companies combined. The fact alone is confirmation that *Form Cores* is the leader in high temperature aircraft engine coating technology. We have built the technology many months ago and has for some time been in a regular production line.

WILLIAM WALTON
Public Relations Manager
Ray Aircraft Co.
Lindbergh Field
San Diego 12, Calif.

The Radar Series

Your "May Unwrap APS-C Tripod Ruler" article May 12 is interesting and obviously written in haste, however, and my intention of the extensive design work done by Rodin Pacific on the APS-62A is known to our engineers so ad that you put the letter which will kindly outline our participation in the engineering phase of the program.

Readers Pacific was directed by the Service to make changes in the AP6 QLT to allow untreated materials, greater use of maintenance, and better performance. The argument has been consistently and successfully carried out by our engineers. The American Water statement on page 44, "This Readers Pacific... units have highly efficient internal packaging and layout from the RGA staff," implies that Readers is merely a "new supplier" of an existing design and overlooks the very real engineering improvements incorporated in the Readers Pacific AP6-QT3.

Example 3. A selection of Item 29 is one intercalating photoconductor in this synchrotron. The elimination of parts and necessity for adjustment, achieved by the use of more stable materials, is an obvious and important maintenance advantage. A lighter weight smooth screw was designed. New photostays (spacers) have been incorporated in a redesigned smooth screw drive assembly. The IF stay has been completely re-engineered. New zinc lines were designed and made an integral part of the IF stay.

Flight tests in an Air Force C-47 last week demonstrated the effectiveness of these and other Avia-Pac's improvements.

B. C. Frazier
Bender Pacific Division
General Manager
Bender Amtronic Corp.
11608 Sherman Way
North Hollywood, Calif.

Would you kindly send us twelve copies of the May 12 issue of American West. We thought the article by Philip Glass in regard to AFK41 order was very excellent.
A. N. Coates

Plant Manager
Radio Corporation of America
RCA Victor Division
11515 W. Chicago Boulevard
Los Angeles 44, Calif.

Pilots and Judgment

In reference to recent airline crashes, I ask what is a vertebra pilot? Is it some one with thousands of hours and many years of flying? Or shouldn't it be more years of flying with thousands of hours, plus good

I remember deadheading having one trip on one of our outfit's outfits. There were two first pilots, both new, checking on another out on the route. One hour out of Aspen on his own class his No. 1 engine went out and had to be feathered. In a few minutes the crew chief landed me a life vest and said we were going to ditch.

Not risking the skin of anything I was in the subject's company. They and their cousin's hold animals and neither one had ever had an injury. We were still at 5,000 feet and they were still trying to cross at four-acre power settings. After going three power settings and losing an animal, I returned to my tent as he lay at the tail as possible, with my focus closed.

Later on, I learned that we were getting that one of those flat piles some time before, while tearing up all the edge at Bismarck Field 5,000 ft. runway, which attempting a takeoff with pilot tube cover on. After rising up 7,000 feet of runway wandering, he no longer on the indicator, he cut the engine and piled it up. Who knows? Maybe he is an airline captain to day. A salute of his achievement was appropriate.

1 figure of cases where no pilots with two or three cases with an airline finished their ATB and in two times before getting any

I believe the witness needs a better system of being . . . It seems that one month's work will now cause experienced pilots with good judgment and with months' work systems . . . believe they should have talent about and searching for good pilots checking their boxes and getting to know something about the area before he is hired. Once a tender has one a hard, and in the union, it may be hard for the union to do nothing.

A little more care in selecting plants and checking inventory systems for locally produced may first test. No collection upon the grounds of possible online sales.

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[Editor Robert W. Wood, whose telephone
 number appears on this sign, is an auctioneer]

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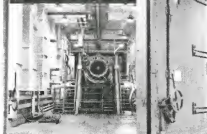
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Lockland provides for rapid expansion to meet national emergencies as well as a foundation for peace time production. While its recent rapid growth has been due mainly to the demands of increased aircraft production, Lockland will remain to spearhead the progress of aviation and to bulwark national security.

Features of the new plant are a new parts production building and a new engineering and administration

building, both recently completed, and a new Components Development Center now under construction. One large building, previously used for assembly of production engines, is now devoted to development work to bridge the difficult gap between experiment and production. Two huge new test cells, with a common control room, have been built especially large to accommodate engines of extremely high thrust ratings.

During the fastest ten years in history, jet engines designed and developed by General Electric have powered more planes, set more records, and flown more hours than all other U.S. jets combined. Now, with this experience, a team of skilled workers and the new facilities available at Lockland, General Electric works for the future.

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